

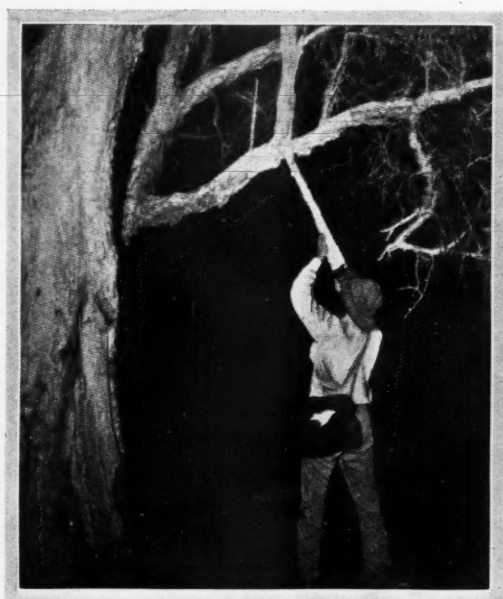
DISCOVERY

A Monthly Popular Journal of Knowledge

Vol. IX, No. 107.

NOVEMBER, 1928.

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(see page 354)

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Editorial Notes.

FOLLOWING our comments last month on the unsatisfactory position of public information about television, we have been afforded a special demonstration of the Baird Television Company's apparatus. It must be admitted at once that the improvement achieved since we last saw their results is perhaps more remarkable even than the progress from the outset in April, 1925, when *Discovery* first brought Mr. Baird's invention to public notice. The mere shadows which preceded the blurred facial image of a year ago have now given way to a fairly distinct picture, and the gold-rimmed spectacles of the sitter were clearly seen on the receiver as the head moved from side to side. Furthermore, in place of the battery of high-powered lamps to which the sitter was exposed before, a single beam of light now suffices for illumination. The method, however, still depends on mechanical revolving discs, and on the receiving screen a "flickering" image is unavoidable. We gathered that this disturbance had been reduced to the minimum on the present apparatus, and if it is inseparable from the transmission of so small an object as the human head, the day when larger scenes can be transmitted is evidently still a long way off. The American workers are using a similar apparatus, and it is significant that the "play" so widely announced as televised successfully now appears to have consisted merely of a series of head-and-shoulder monologues. This factor seems likely to be one cause for Mr. Baird's failure to satisfy the B.B.C. and the Post Office engineers that his system is as

yet suitable to justify trial through a B.B.C. broadcasting station.

* * * * *

On present lines television requires a wave length several times shorter than those being employed for broadcasting speech and music. The laboratory pictures are transmitted over a wire, which affords much clearer results than when the waves are broadcast through space and have to compete with atmospheric interference. For reasons such as these, which are dealt with on another page by Mr. Campbell Swinton, F.R.S., a critical attitude is necessary from the scientific standpoint. At the same time we cannot entirely agree with our contributor's somewhat pessimistic comparison with other forms of pictorial reproduction. The two ideas are by no means comparable. The chief object of television must be to convey a transient impression through the medium of the eye. Other forms of reproduction are by their nature permanent records. We hold no brief for any television system, but if it should be the case that the Government monopoly in broadcasting is holding up experiments—however crude—which might otherwise be proceeding apace, the position requires further explanation. As the result of the B.B.C. decision, the Baird Company have announced their intention to conduct transmissions in France and Holland.

* * * * *

In these days the discovery of documents that prove of first-class importance to the historian is becoming of rare occurrence, if only for the reason that there is an increasing curiosity in the past. Few persons possessing books or papers of likely interest now fail to investigate them, yet that there is still unrevealed material is shown by the discovery which Sir George Aston describes in this issue. How he came upon the diary of an Austrian diplomat among the shelves of a country bookseller, is curiously reminiscent of the find by Professor Waterhouse of an unknown version of Goethe's "Faust," described in these columns a year ago. The career of Philipp von Neumann, the subject of the new discovery, has an interesting analogy in more recent times in that of

Walter Hines Page. Except perhaps that the late American ambassador had difficult relations with his own Government, who regarded him as pro-English, both these foreign visitors were popular in London society and both recorded their impressions. One aspect of the diary not mentioned elsewhere is that in writing it Mr. Beresford Chancellor has removed a few sentences likely to cause pain to living descendants of the persons concerned. There has lately been a crop of books published with apparently no other object than to damage great figures of the past, and Mr. Chancellor's example cannot be too widely praised or copied.

* * * * *

Our recent paragraph on Dr. Robert Millikan's new theory of the universe has been expanded in the Messel memorial lecture, which he gave in New York to the Society of Chemical Industry. The theory rests on an exact measurement made of the amount of lead in a mineral known as Black Hills Uraninite, which, while no great technical feat in itself, has revealed the important knowledge that there is another term of a billion years for life on earth. From a correlation of Einstein's and Aston's recent work he comes to the conclusion that "radio-active disintegration with the ejection of an α -particle is a process that can take place only in the case of a very few of the very heavy and very rare elements." As the great majority of the elements constituting our world are in their state of maximum stability, there can be no utilization of energy consequent upon "exploding" the atom! On the other hand, atom-building is a source of energy. Dr. Millikan, in collaboration with Dr. Cameron, has isolated three definite cosmic ray bands with 12, 50 and 100 times the penetrating power that can be obtained from any disintegrating process. The most penetrating X-rays pass through three inches of lead but these new rays will traverse 200 ft. Sunlight has no influence whatever on their strength and they come in with equal intensity from all directions.

* * * * *

Dr. Millikan reaches the conclusion that "the processes which give rise to these rays are favoured by, and actually have their source in, the places in the universe where the temperatures and pressures are extreme . . . that is, where they are close to absolute zero." There is thus pictured a continuous atom-destroying process taking place under the extreme conditions existing in the interior of stars, and from its influence an atom-creative process continually taking place under the equally extreme conditions of just the opposite sort in inter-stellar space. If

these interpretations are true, then the universe is in a steady state. There is no "heat death" to be feared for the future of the universe, as the assumptions of Professor Jeans, Stern and others would require.

* * * * *

One point emphasized by the National Radio Exhibition held a few weeks ago at Olympia was that listeners have much to be thankful for from the refusal in 1922 of the then Postmaster-General, the Rt. Hon. F. G. Kellaway, to grant a monopoly in receiving sets. "Every firm in the country capable of producing cheap and efficient receiving sets must be allowed to become a member of the Broadcasting Company on reasonable terms," was the principle on which the foundation of the trade was laid. In consequence of this far-seeing policy there were now nearly two hundred exhibitors showing a wide range of high standard material. Rivalry between the exhibiting firms has increased owing to the more critical attitude of the listener in regard to the performance of his set. On the other hand, a notable new development is the production of many more sets for the ever-growing public who enjoy solely the aural entertainment, and to whom wireless as a hobby makes no appeal. "Tuning-in" is often a long and tiresome process on the average two- and three-valve set, but one of the new models exhibited will receive six stations by no further adjustment than moving a single switch. Simplification, in fact, is perhaps the most notable tendency in wireless to-day.

* * * * *

When the British Association visits South Africa for its meeting next summer, a question likely to be widely discussed is the origin, history and purpose of the prehistoric ruins at Zimbabwe and similar sites, chiefly in Southern Rhodesia. These monuments have been described and partially explored already, for example on the Association's previous visit in 1905 careful studies were made by Dr. Randall MacIver, whose conclusions, however, were not universally accepted, especially in South Africa. The further visit would therefore seem an opportunity to clear up these doubtful and other points. It has been ascertained that the Government of Southern Rhodesia would welcome such work, and the council of the Association has appointed to conduct it Miss G. Caton Thompson, who has had varied experience as an excavator in Egypt and Malta. We understand that there is already another expedition in South Africa engaged in prehistoric studies, and full justice should therefore now be done to an obscure and fascinating problem.

Television : Past and Future.

By A. A. Campbell Swinton, F.R.S.

After describing the history of television experiments, Mr. Campbell Swinton examines the principles on which present methods are based, and advances a possible solution of the problem. This article is commented upon in the Editorial Notes.

THE history of what is now known as television goes back for many years, and begins, so far as is known, with a suggestion of G. R. Carey, an American, as long ago as the year 1875. This suggestion was based on what takes place in the human eye, which consists of a camera obscura containing a lens whereby the image of what is looked at is thrown on the retina. The surface of the retina is composed of a mosaic of very minute cells each connected by a separate nerve fibre to the brain, so that stimulation of the different parts of the mosaic of the retina by the varying light of the image thrown on it by the lens, is carried by the nerve fibres to the brain, and there causes a conception of the image.

Early Ideas.

Carey's idea was to replace the mosaic of the retina by a mosaic of a large number of minute selenium cells, the electric resistance of which varies under the influence of light, and, further, to replace the nerve fibres by separately insulated electric wires carrying an electric current from a battery, and to use this device to vary the light given by a number of very minute electric lamps, equal in number to that of the selenium cells and of the electric wires, and so placed that each lamp would correspond in position to each of the selenium cells, and, by giving more or less light, would reproduce the image thrown on the selenium cells by a photographic lens at the distant end.

Similar suggestions for television were made by Ayrton and Perry, the English professors, in 1877, and also by E. Rühmer, a German, and Senlecq, a Frenchman, some of whom actually made working models based on this principle. At a later date, in 1908, Mr. Shelford Bidwell, in England, further experimented on the subject, and calculated that to give good close-grain results on a screen only two inches square would require no less than 150,000 each of cells, wires and lamps; while to give very coarse results, about equal to the coarsest process blocks at that time used for reproductions in the newspapers, about one-tenth of this number would suffice, but that, in any case, the expense for transmission over

any considerable distance would be quite prohibitive from a commercial point of view.

Since these far-off days there have been many and diverse suggestions for obviating the necessity for the enormous number of connecting wires required for any realization of Carey's proposals. These are too numerous and too complicated to describe here, except to the extent of mentioning that they comprised methods in which the use of both electrical and acoustical resonance was suggested in order to reduce the number of wires, the arrangements in some cases being similar to those used in multiplex telegraphy, where a number of different messages are sent simultaneously over the same wire.

Then came the idea that, instead of trying to transmit simultaneously the enormous number of separate signals required to deal with the various parts of the transmitted picture, these signals should be sent one after the other with sufficient rapidity that the sending of a complete set would occupy only one-tenth of a second, so that the persistence of human vision, which has about that duration of time, would simulate a constant effect and cause continuous perception of the results. This is, of course, the same idea as that embodied in the cinematograph, where succeeding pictures are usually projected so as to follow one another at the rate of sixteen per second, so that the eye does not notice the sudden changes in what it sees, but takes the motion of the moving parts as continuous. The difference between this application of visual persistence to television from its application to cinematography, is, that whereas in the latter they are complete pictures that follow one another in rapid succession, in the former they are only parts or elements of a single picture that do this.

All modern systems of television are based on this principle of dissecting the pictures to be transmitted, into a large number of elements which are signalled one after the other, the persistence of vision being relied upon to combine the pieces into a comprehensive whole. Moreover, there are only a very few main methods in use whereby this is effected, and all of them, though hailed by the press as examples of modern inventive genius, are really quite old. The

most favoured method for chopping up the picture into the required elements appears to be the use of revolving discs containing apertures staggered in position with reference to the centre on which the disc revolves, so that the beams of light passing through the apertures cover the whole picture, piece by piece, as the discs revolve. This idea is, however, as old as 1884, when a German, called Nipkow, patented it. Another method is to use mirrors fixed on the periphery of a rotating wheel, but this was proposed by Lazare Weiller in 1889; while rapidly vibrating mirrors for the same purpose go back to Szecepanik's patent of 1897. Even the method of illuminating the object to be televised by a rapidly moving spot of intense light, recently hailed as a new and important improvement, is not original, as it is described in the patent of the Swede, Ekström, of 1910.

If, however, anyone wishes to read a very complete technical account of the history of television from its earliest inception up to the present day, he is referred to the remarkably erudite and impartial article on the subject, called "La Télévision Electrique," written by Monsieur A. Dauvillier, the well-known physicist of Paris, and published by him in the *Revue Générale de l'Electricité* for 7th January, 1928. As will be seen from this historical account, there is very little new in modern methods of television at present in use. Most of the novelty consists in the application of thermionic amplifiers and other wireless appliances to assist the results.

Some Comparisons.

To judge from the enthusiastic paragraphs contained in some of the newspapers, it is doubtful whether the public realizes how very poor and limited are the results of present-day television as compared with other methods of reproducing pictures, such as are used in ordinary photographic prints, in cinematograph films, and in the better class of photographic reproductions in the papers; nor is it realized that present mechanical methods of television seem to give no scope for much improvement in this respect.

If we take ordinary photographs, the fineness of the grain of all descriptions of prints, whether the image consists of silver or carbon, or other materials, is very great, and cannot be detected by the naked eye nor even with considerable optical magnification. Indeed, lantern slides and cinematograph films are required to stand magnification to thousands of times without showing any noticeable grain. Even when we come to photographic process blocks such as are used for book illustrations, the grain is still very fine; and though we get to a coarser form of block that appears

in some of the newspapers, we are still dealing with a granular structure that is built up of grains or dots to the order of thousands to the square inch. Thus, in pictures of any considerable size, the number of dots of which the picture is composed is very large, as, for instance, in a recent one in *The Times* depicting the Eton and Harrow cricket match, measuring about 16 inches by 10 inches in size, the grains or dots amounted to over a quarter of a million, or about 1,500 to the square inch.

Mechanical Factors.

Now, when we turn to the best that can be obtained with modern television, we find a very different story. In the best television pictures so far obtained, the light bands employed do not exceed about fifty in number, and if we make the reasonable assumption that these are each divided up individually into fifty parts, the total number of elements we have wherewith to construct the whole picture only amounts to 2,500 in all. Now, with so small a number, obviously only the simplest of very small pictures can be constructed, and as even with so small a number of elements, seeing that each has to be registered sixteen times per second, we have a total of 40,000 to be dealt with per second, which is about as much as the present mechanical means can manage.

So far, indeed, only the simplest forms of pictures can be dealt with satisfactorily, and when we come to actual facts, we find that this is the case. For instance, it is reported from the United States that one of the three well-known television concerns there recently made a pretence—one can call it nothing else—of transmitting a play by television. To begin with, in order to simplify matters, a play containing only two characters was selected, but even this was not a sufficient restriction to suit present television possibilities, and what was actually transmitted and received on a screen only four inches square were images of only the heads and shoulders of the two performers in the play. This gives some idea of what the newspapers call wonderfully successful television.

Recently there was reported in a well-known London journal that the paper had been televised, and one naturally supposed that at least the leading article could be read on the receiver. As it turned out, however, all that had been transmitted and received was the contents bill, consisting of print with letters probably whole inches in dimensions, none of the letterpress of the paper being decipherable at all.

It is not surprising, therefore, that it is very rarely that reproductions of the pictures actually received by television are published in books on the subject,

or in the accounts in the newspapers. What will pass muster as a likeness in a series of flashes on the dark screen of a televisior will not bear cold-blooded critical examination as a still photograph, and thus in all the vast amount of illustrated literature published on the subject during the past two years, there only appears to be a single facsimile of a portrait transmitted by television. This is supposed to represent a man's face, but can only, with some degree of imagination, be recognized as such.

This is very different from other methods of transmitting still pictures by wireless or wire telegraphy, where photographs are automatically transmitted dot by dot by slowly rotating apparatus. Here, photographs can be reproduced virtually as good as the originals; but it is one thing to send still pictures at a rate at which it takes several minutes to complete the operation, and quite another when the whole operation has to be repeated completely sixteen times in every second, as is the case with television. In the former case, large and complicated pictures can be transmitted as easily as small ones, though at a greater expenditure of time, while in television the time limit of one-sixteenth of a second necessary to avoid flickering quickly puts a limit to the size of the picture and also to the number of elements into which its complication requires that it ought to be divided. This in many ways is unfortunate, as for exhibition purposes it would be well if the received pictures could be optically enlarged and thrown on a screen that a considerable audience could see. This, however, is at present out of the question, as if even the best results of television are much magnified, they become entirely unintelligible.

A Suggested Solution.

It is reasons like this that years ago prevented the development of television, as those interested foresaw the extremely limited nature of what could possibly be obtained by all forms of television which depended upon the mechanical movement of material parts, such as discs or mirrors; and even to-day there are those who doubt whether all the money, time, and trouble that have been spent in bringing mechanical television to its present stage of development has not largely been wasted, as it seems that it can only lead to a dead end beyond which no improvement is possible. Amongst those who hold this view is the present writer who, some twenty years ago, put forward a suggestion whereby television might be obtained without the use of any mechanical moving parts at all, the only moving things employed being the electrons of cathode rays, which are practically free from inertia,

and, moving as they can be made to, at velocities approaching that of light, which is no less than 186,000 miles per second, are at the same time the most docile entities in all nature, being easily and practically instantaneously controlled in their movements by both magnetic and electric fields.

Only recently no less an authority than Sir Oliver Lodge, who, let it not be forgotten, is one of the original inventors of wireless telegraphy, has revived this idea by publishing several articles advocating that an experimental attack should be made upon television by means of electrons, whereby it is hoped that the present limitations of mechanical methods may be eliminated. Until some success has been obtained in this way, and television is rendered able to deal with much larger and more complicated figures than its limitations at present allow of, it is scarcely open to much doubt that the promised televising of extensive scenes, such as a cricket match at Lord's, or the race for the Derby, will remain impossible of achievement.

Murder by Telephone ?

THE dramatic title above is not abstracted from a novel by Mr. Edgar Wallace but is given to an announcement issued at Princeton University, U.S.A., by Professor William Richards, of the Department of Chemistry. Experiments are being made with super-sound waves of high intensity, which, it is stated, will burn a man's finger, kill small animals, shatter glass, cause explosions, boil liquids, and accelerate certain chemical reactions. Human beings could be killed if they should come under the influence of waves of sufficiently high intensity, it is remarked. The super-sonic waves, which are waves of sound too intensified to be heard by the human ear, are produced by a quartz crystal oscillated by an apparatus similar to that used for radio broadcasting.

When the waves are turned upon a glass receptacle containing pure water, the water becomes turbid with minute particles of glass torn or "atomized" from the sides of the container. Gases are expelled violently from liquids by the waves and liquids are caused to boil at temperatures below their usual boiling point. Water, for example, will boil at 98° Centigrade, instead of at 100°. In frogs and mice the waves cause anemia which apparently leads to death. Although somewhat similar in action to waves set up by explosions, super-sonic waves are differentiated by their characteristic of recurrence. As the waves alternately expand and contract, there is a corresponding fluctuation of high and low temperature in the matter which they strike.

The Finding of the Neumann Diaries.

By Sir George Aston.

By the author's discovery of a diary kept throughout the reigns of George IV, William IV, and the earlier years of Queen Victoria, much new material has been revealed to the historian. Identification was complicated by imperfect handwriting and the fact that the manuscript was in French.

I REALLY cannot claim to have found the diary of Philipp von Neumann, the Austrian diplomatist who throws so much light upon social life in England and upon European history in the reigns of George III and IV, William IV, and the early years of Queen Victoria's reign. It would be more accurate to say that the diary first found me. I live in a country village about five miles from Salisbury. When in the city with time to spare, I spend it talking to Mr. H. M. Bates, the bookseller, with whom I share an affection for old oak, old books, and fly-fishing.

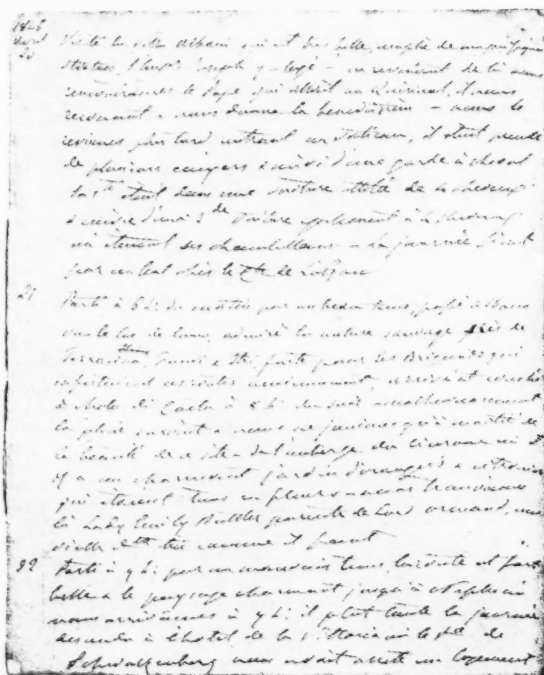
When we were so engaged about two years ago, he asked me whether I would care to buy a bundle of copy-books, written in French in the form of a diary, which he had obtained with other odds and ends from a colleague in Frome. He believed them to contain the diary of Lady Georgiana Codrington, whom he thought was the wife of the Admiral of Navarino fame, as the diary contained references to that battle. The authorship was so described in his printed catalogue. I could see no reason why the good lady should have kept her diary in French, so I took no further steps at the time. Later on I thought matters over, and I finally decided to buy the manuscript and to spend what time I could spare in further investigations.

As a member of the committee of the Institute of Historical Research in Malet Street, Bloomsbury, I had access to the wonderful library there, so it was an easy matter to discover that the name of the wife of the victor of Navarino was Jane,

not Georgiana. I then referred to Lieutenant-General Sir Alfred Codrington, with whom I had contracted an acquaintance when we returned in the same transport from the South African War. I asked him whether he had any letters from his late relative Lady Georgiana. He soon found some, and we compared the handwriting. He found it so similar to that in the diaries that I thought that Mr. Bates must, after all, have been right. In order to make certain, we checked the dates of her letters, and the places from which they had been written. This showed us at once that we were on the wrong scent. The entries did not agree. Then, early in July, 1926, I had the good fortune to meet at a history conference Professor Paul Vaucher, of the University of London. He was good enough to undertake to look through the diaries, which are very voluminous, and to give me his opinion on their authorship, if disclosed. His report, dated 16th July, 1926, lies before me:—

"The diary appears to be the work of an Austrian diplomat M. de Neumann, who was at the Austrian Embassy in London from 1815 to 1821, again from May, 1822 to 1825, and from 1828 to 1829. (See Record Office Indexes of Foreign Office Papers.)."

Professor Vaucher was good enough to add references to early extracts from the diaries containing evidence in support of his opinion. The first extract showed that "the author is a gentleman"—"is not an Englishman"—"is a diplomat sending despatches to Vienna." Then:—"The whole diary shows that he is



By courtesy of Messrs. Philip Allan.

A PAGE OF THE DIARY.

working under Prince Esterhazy, the Austrian Ambassador. His rank is not indicated, but he comes no doubt immediately after the Ambassador himself. He is a man of rank and considerable importance. (The Regent talks with him on German affairs, 4th December, 1819. During a visit to Paris on 3rd April, 1831, he dines with the Royal Family and is seated next to the Queen.) He has not the rank of *ministre plénipotentiaire*, but in 1827 he is sent to Brazil on an independent mission—Esterhazy asks for him the new post of minister at Brussels (22nd October, 1831) but he is not appointed; see 26th November, 1831. I therefore think that the author must be M. de Neumann."

Professor Vaucher, after quoting further corroborative evidence, wrote that the diary is interesting because the diarist gives the general news on current events, repeating anecdotes and news that he heard. He was in close relation with the Duke of Wellington, and when Talleyrand was appointed to the French Embassy, Neumann was in the habit of dining with him *en famille* two or three times a week.

Through Professor Vaucher's kindness I was thus put on the scent, but about eight years' experience in the research methods of real historians, under Professor A. F. Pollard at the Institute of Historical Research, had taught me to beware of such expressions as "I think." I next applied to the Austrian Legation in London, and they were good enough to apply to the archivists at Vienna, who offered to place all their resources at my disposal. They sent me a short biography of Neumann from the *Haus-Hof-und Staatsarchiv*, which contains very comprehensive material about him. The report began:—"He was born in Vienna about 1778, married in 1844 Lady Augusta Somerset, died at Brussels the 14th January, 1851." Due note will be taken of the point that there is no mention of parentage in the report. On this subject Mr. Buckland, of the Record Office, called my attention to a letter from Ernest of Hanover to Lord Strangford attributing the paternity to Prince Metternich, but this, from its source, seemed to me to be mere gossip unsupported by evidence.

I then sent the original diary to another friend, P. B. M. Allan, the publisher, who noted the point about marriage with Lady Augusta Somerset (sister of the Lady Georgiana Codrington, mentioned above) in 1844, consulted the manuscript, and found the reference to his marriage by the diarist. This finally established his identity, and the chase was over. Mr. Allan offered to publish extracts from the diaries, translated into English, enlisting the aid of Mr. Beresford Chancellor for the purpose as editor.



By courtesy of Messrs. Philip Allan.

ANTONIE VON LAYKAM.

Second wife of Prince Metternich, from a painting by Johann Ender.

A long delay ensued, on account of the difficulty in finding someone to type out the six hundred pages of French manuscript, closely written in handwriting not easy to decipher. One French lady, after long delay, threw up the task. In the end, I was so fortunate as to obtain the help of Miss Z. Faiers, of the staff of the Institute of Historical Research, who not only typed clearly two copies of the whole manuscript, but also deciphered the numerous names, both of eminent and of hitherto obscure folk, whom the diarist mentions.

That is the story of the discovery of the Neumann diaries, and of their authorship. It was a good hunt, and I commend such a chase (as being superior to "hunting for spectacles," sometimes called the last sport of the aged) to those in search of a hobby.

The diaries with which Sir George Aston deals above have now been published by Messrs. Philip Allan,* by whose kind permission the illustrations are

**The Diary of Philipp von Neumann. 1819-1850.* Translated and Edited from the original manuscript by E. Beresford Chancellor, M.A., F.S.A., F.R.Hist.Soc. (Two volumes. 42s. the set).

reproduced, together with the following notes from Mr. Beresford Chancellor's preface.

Writing of Neumann, Mr. Chancellor enumerates the unusual circumstances which combine to give his record of men and things a significance of its own—the high and responsible position which Neumann occupied; the large and varied circle of his acquaintances; his interest not only in his special world of politics and diplomacy, but in those of art, music, and literature; his undoubted charm of manner which made him a favourite at court and welcome amongst the highest circles of at least three capitals. The diary has, too, as agreeable a variety in its tone as it has in the topics with which it deals. It must also be remembered of Neumann that when we follow him to his own country, unlike some who have found favour among foreigners but have not been so universally successful among their own people—like the proverbial prophet he was, if possible, even more a *persona grata* there than in England.

The Manuscript.

Throughout the diary, even when it perpetuates serious and important matters, makes light and pleasant reading. For it is really a diary, written clearly with no thought of publication, and thus free from that somewhat factitious style which, in spite of their essential value, detracts from the easy charm of not a few similar records. The Neumann diary is of additional interest in that it is the only one covering a similar period besides the well-known one kept by Charles Greville. But Greville's diary, invaluable as it is, is here and there verbose; and—especially in the later part—if the truth must be told, a trifle heavy. Indeed, it is not a diary or journal so much as an elaborate record of selected events and a collection of character-studies. Neumann's record is, on the other hand, a diary pure and simple. The original manuscript consists of about thirty-five sections, written closely in French on both sides of the pages and extending to some 400,000 words. To have published the whole would obviously have been excessive, and by editing, the grain has been relieved of most of the chaff. Mr. Chancellor assures the reader, however, that no serious omission has been perpetrated.

The entries are frequently made more valuable by notes of conversations, anecdotes, and gossip of the day, and then they become important as helping to build up a picture of English society at a time when that society was undergoing a change from the free-and-easy days of the Regency to the strict and immaculate *aura* spread over it by the influence

of Queen Victoria and Prince Albert. For the period during which Neumann was living in this country, and noting daily some event of more or less importance (from 1819-1850, though not continuously), was one of the most interesting and significant in our annals. It was the end of one *régime* and the beginning of another.

A New Era.

Stated in simple words, the blustering age of George IV, whose characteristics were to no little extent carried on during his successor's ten years of sovereignty, suddenly gave place to a sedate and temperate period; and a fact recorded by Neumann that cards were not permitted at Windsor on a Sunday can be placed as a companion piece to the lurid happenings at Carlton House and the factitious atmosphere generated from the Cottage in Windsor Park of but a decade earlier. It does not always follow, of course, that the example set by a Court is necessarily followed by Society at large, but in the case of Queen Victoria, Society began to be influenced by the young Queen; and if it never wholly resigned itself to the restrained manners and decent customs of a new *régime*, it took care to act outwardly as if it did. The moment between the death-bed scene at Windsor and the famous early morning scene at Kensington Palace inaugurated an entirely new scheme of things.

The outstanding events which are, *inter alia*, recorded in the diary, comprise the accession and coronation of George IV, the Cato Street Conspiracy, the trial and death of Queen Caroline, the death of Napoleon I, the murder of the Duc de Berry and the fatal accident to the Duc d'Orleans, the trial of Hobhouse before the House of Commons for libel, the death of George IV, and accession of William IV, the excitement incident on the introduction and passing of the first Reform Bill, the revolutions in Spain and Portugal, the death of King William and the accession of Queen Victoria, her marriage, the two attempts on her life by Francis and Oxford, the Chinese and Afghan Wars, with a long *et cetera*.

Neumann in the course of his diplomatic duties, as well as on the occasions of holidays and pleasure jaunts, travelled about much both in England and on the continent. In some cases his itinerary and the time occupied in travelling, which he is at pains to record, are of no little value as indicating the marked differences in the mode and time occupied on a journey a hundred years ago from what obtains to-day. For example, he records on 10th July, 1830, that the news of the capture of Algiers five days

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previously proves the utility of the telegraph! On other pages of the diary a full account is given of a journey to Brazil, which enabled Neumann to investigate a country which was then something of a *terra incognita*; and his descriptions of the rulers of that land, its natural characteristics and potentialities, will now be read with especial interest.

His criticisms of people are as acute as those places. Sometimes he gives a character of a man or woman which, if not on the full-length scale affected by Greville, nevertheless conveys a vivid impression of the personality described. That Neumann was undoubtedly a "lady's man" is brought out by his many references to the brilliant figures of the day. For example, on hearing of the death of the young Princess Metternich he was "overwhelmed with grief," not only at the heart-rending sorrow of Prince Metternich himself, but at the loss of an intimate friend.

At other times he records the opinions on momentous occurrences which he hears from the lips of their protagonists—Talleyrand or Wellington or Metternich,



By courtesy of Messrs. Philip Allan.

PRINCE TALLEYRAND.

From a sketch made in London in 1834.

as the case may be. We thus obtain from the diary much information bearing on famous events from, as it were, a new angle; and if a few of the anecdotes are already known, by far the majority are new.

*

Correspondence.

IS THERE A SURPLUS MALE BIRD POPULATION?

To the Editor of DISCOVERY.

SIR,

In the letter from Mr. M. P. Price I think I recognize the style, and ability as a field naturalist, of a former pupil of mine at Harrow in 1900. If so, his "Vertebrate Fauna of Harrow," published in 1903, recording his original observations here, still remains the standard book on the local avifauna and bears witness to his powers of observation even at that age. Mr. Price has rightly forgotten what I tried to teach him about some interesting existing work on the question he has raised, but as Mr. Nicholson does not mention it either in his reply, I venture to draw your readers' attention to it, instead of merely writing to Mr. Price.

I do not possess the "Proceedings of the Zoological Society," so can only quote from memory and from my lecture notes culled from various sources, but in this connexion more particularly from a paper by Stolzmann in the "P.Z.S." of 1885.

Stolzmann advances a theory of his own to account for sexual dimorphism in birds. When I was a boy I had the privilege of hearing Dr. Alfred Russel Wallace discuss this theory in his own study when he was challenging Darwin's theory of Sexual Selection—Wallace, of course, was developing his own views on both surplus vitality and the protective colouration of the nesting females as more efficient causes of the divergence of the sexes.

Although it is only the data which are germane to the point at issue, it may be worth while recalling Stolzmann's theory—its validity does not matter, but its ingenuity is considerable. Stolzmann satisfied himself as to the reality of the surplus male bird population. He argues that these surplus males are a serious disadvantage to the species—the unattached bachelors persecute the females during courtship and even incubation, causing potential divorce cases in the bird-world during this important period for the species—and also diminishing the available food supplies, etc., for the mated pairs of their own species.

Therefore anything tending to reduce this surplus number will be seized upon by Natural Selection and perpetuated. So the bright colours of the males have been evolved in order to attract attention and increase the death rate amongst them. They are rendered more visible to their enemies and more freely killed by hawks and other foes—their display plumes make them less efficient on the wing—and their very pugnacity leading to their killing each other also helps to reduce their number and thus benefit the species as a whole.

I have done but scant justice to his theory in this outline, for those who are interested a large array of facts are given in support of it by Stolzmann in his paper. But the dominant issue of the whole theory and the hypothesis on which it rests is the existence of this surplus male population. Stolzmann collected very large numbers of the same species of birds in Peru, and he gives his figures showing how far the males outnumbered the females in his series.

In my note is also the statement that of 980 birds collected by Mr. Guillemard on the cruise of the *Marchesa* round New Guinea 584 were males, 285 females, and 111 of undetermined sex—giving on any distribution of the last number a considerable numerical superiority of males. I cannot remember if this last

set of figures is given by Stolzmann or if it comes from another source.

Of course, it matters considerably under what conditions Mr. Guillemard got his birds, for the very fact that the males are conspicuous—not so shy—and not occupied with incubation would make them an easier prey to a collector and therefore likely to preponderate.

The whole question has stuck in my mind and made me keep my notes, because it was the first scientific inquiry with which I was ever concerned personally. Dr. Wallace suggested to me that I and my boy friends should shoot, catapult, or trap "a few hundred starlings and house-sparrows" for him. We boys took this commission with the most whole-hearted approval! In the course of the winter of 1886 we provided him a total of 812 sparrows and 289 starlings. Dr. Wallace pronounced his results as sparrows—433 males, 379 females; starlings—157 males, 132 females. I well remember him pushing his spectacles up over his bushy eyebrows and commenting on his figures:—"Well, you see Stolzmann was right about the cock-birds—I wonder why that is so." The murders were committed at Godalming in Surrey—I do not attempt to justify them though the diminution in the sparrow population may have helped the local gardens. But for other species, at all events, more humane methods such as Mr. Nicholson suggests, are certainly to be preferred.

Two further observations bear on this part of the subject. My friend, Mr. Vesey Stoney of Rosturk Castle, Westport, Ireland, is a keen ornithologist and trained observer. He has kept careful observations of the choughs which occur in large numbers in his district. There is a large non-nesting surplus over mated birds—these remain gregarious throughout the year, and he is satisfied that these flocks are males—though personally I should not care to distinguish males from females.

The other point is that my nesting boxes in the spring are frequently captured by house-sparrows instead of the lesser-spotted woodpeckers I hope for. Quite frequently two cock-sparrows seem to be associated with one hen-sparrow and one nest. I have not seen unmated hen-sparrows about, but I cannot vouch for the relationships in these trio nests. By the time I see them they seem to be settled down to this state of affairs—neither male resisting the other. Possibly it is a case of incipient polyandry, but it indicates more males than females. Stolzmann in his paper concludes that the male preponderance is chiefly due to the influence of nutrition upon sex: males resulting from badly nourished eggs and females from the better nourished—much as the queen bee is produced from a larva which has been specially fed. But the validity of this hypothesis raises another question—well treated in the "Origin of Sex," by Geddes and Thomson. Stolzmann maintains that owing to nest-building, incubation, etc., in many species, the female has less time for supporting herself than the male—and possibly the active males, if they are in better condition than the females, will reproduce more males. A naturalist taking up this inquiry presumably would be able to determine if there is any difference from others in sex ratio in those species in which the males incubate or assist in incubation.

I do not recollect if Stolzmann offers any explanation of brilliantly coloured males in polygamous birds—in any case, if there is any rule of surplus males they must be an exception.

Yours sincerely,

Elmfield,
Harrow-on-the-Hill.

ARCHER VASSALL.

PULVERIZED COAL FOR SHIPS.

To the Editor of DISCOVERY.

SIR,

We note on page 286 of the September number of *Discovery* a paragraph dealing with pulverized coal for ships, in which it is stated that the steamer to be built for the Berwindmoor Steamship Co. of Liverpool will be the first ship built or owned in Britain in which this method of using coal will be introduced. This statement is not correct, as we have equipped the first British-built steamer with pulverized coal equipment and this steamer, the T.S.S. *Stuartstar*, has completed a round voyage of 13,000 miles to South America and back with one of her main boilers burning powdered coal. This has proved so satisfactory that we are now fitting this steamer with further equipment on the Tyne, and she will sail on another voyage to South America next week.

The *Stuartstar* is the pioneer British vessel to use this method of burning coal, and we shall be glad if you will correct the statement referred to above. For a description of the *Stuartstar's* voyage we can refer you to the Technical Press, "The Journal of Commerce" of Thursday, 6th September, and *The Times, Morning Post*, etc.

Yours faithfully,

BLUE STAR LINE (1920) LTD.,

E. A. THOMSON,

Senior Superintendent.

40, St. Mary Axe, E.C.3.

15th September, 1928.

We understand that the vessel referred to in our paragraph will be the first specially designed and built for the use of pulverized coal. No doubt other vessels have been adapted for this fuel.—ED., *Discovery*.

A MEMORIAL TO COBDEN.

READERS of *Discovery* are invited to support an appeal which has been issued, with a distinguished non-party endorsement, for the permanent endowment of Dunford House, near Midhurst, Sussex—the home and birthplace of Richard Cobden. The intention is to use the residence in the interests of the promotion of political and economic peace between the nations through the medium of conferences, vacation schools, and similar



gatherings. It is the property of Cobden's surviving daughter and of her husband, Mr. Fisher Unwin, who as a memorial to Cobden's life and work are presenting to the world in permanent trust the house and grounds, together with his library, portraits, and other historical treasures. To secure the efficient working and permanence of the memorial it is necessary that an endowment fund of £25,000 shall be raised. American co-operation has been definitely promised, conditionally upon adequate support for the project from Great Britain.

The Problem of Russia.

By R. B. Mowat, M.A.

Professor of History in the University of Bristol.

Surveying the present relation of Russia to the rest of the world and to Europe in particular, Mr. Mowat suggests historical grounds for predicting that a solution of the problem may not be so far distant as is commonly supposed. Will Russia become a strong bulwark of peace?

It is often said, and with a great deal of truth, that the Bolshevik Revolution has cut Russia off from the rest of Europe. Russia, however, in spite of the spread of Western civilization in the eighteenth and nineteenth centuries, has never been as fully "in" Europe as, for instance, France or Holland. The difficulty of the Russian language, the defectiveness of means of transport, tended to cut Russia off from the stream of European travel. The illiberalism of the Tsarist administration system also deterred visitors from Western Europe. Thus Russia has always been something of a closed book.

A recent work* points out that the Ural Mountains, which so plainly marked off Europe from Siberia on the maps of our early schooldays, have no such geographical or social significance. They are "a geological rather than a geographical landmark." Russia is a huge, and on the whole, flat country, stretching from the Danube to the borders of China, from the Carpathians and Baltic to the Pacific. Russian geographers have given it the name of Eurasia. It is half in Europe, and half in Asia. Mediterranean civilization, which is the civilization of Western Europe, did not take Russia within its sphere. In the years between 988 and 1010, Christianity came into the country, but it was the Christianity of Constantinople, of the Greeks of the Byzantine Empire.

The Orthodox Faith.

"In receiving the Orthodox faith from the Greeks, Russia received a purer and more genuine form of Christianity than it was granted to the West to receive; but the separation of the Churches . . . elevated a barrier between Russia and the Latin West which was for many centuries complete." It also prevented Russia from sharing in the spiritual and intellectual stimulus, and in the religious purification, brought about after the close of the Middle Ages by the Reformation and counter-Reformation.

In the early Middle Ages a large Slavic kingdom came into existence around Kiev, on the river Dnieper.

In the eleventh century Kiev is said to have rivalled Constantinople in culture and in mercantile importance; but after the year 1070 the kingdom declined, owing to the invasions of a Turkish tribe called Cumans or Kipchaks. The Cumans were followed by the Mongols or Tatars, who, under Genghis Khan, swept over the country in 1224. Sixteen years later another terrible drive of the Mongols under the grandson of Genghis Khan resulted in the destruction of the city of Kiev. Many Tatar chiefs settled down on the steppe-land in southern Russia; but in the forest-land to the north of Novgorod became a wealthy merchantile, free city, paying tribute to the Tatars.

Independence.

Novgorod, however, never made itself the political centre of Russia. This position was to be taken by Moscow, a city subject to the Tatars or "Golden Horde" as they were called. After 1380, when Dmitri, Prince of Moscow, defeated the Tatars at Kulikovo, the Tatar power gradually declined. Ivan declared his absolute independence from the Tatars in 1480. In 1547 Ivan IV assumed the title of Caesar or Tsar.

The Moscow princes had thus freed Russia from Oriental conquest. It was, however, probably a misfortune for Russia that the Empire of Kiev had not survived, so that this city could be the capital. Moscow is not merely further east than Kiev (see map, page 347), but it is on no great river, no natural route of communication.

Thus the tendency of Russia to remain secluded from Western Europe was confirmed and even increased. Moreover, the legacy of Oriental invasion and devastation remained; what is called the backwardness of south-eastern Europe, says a writer in the "Cambridge Mediaeval History," on "The Asiatic Background," is due to this—to centuries of frightful onslaught and immigration from the most savage races of Central Asia. "They came every summer, carrying away thousands of Russian captives, whom they sold as slaves in the Mediterranean markets. As late as 1571 they burned the very suburbs of Moscow."

*"A History of Russia," by Prince D. S. Mirsky.

In the sixteenth century, contemporaneously with the reign of Queen Elizabeth in England, Russian political power began to extend over Siberia, and in the course of some forty or fifty years reached the Chinese frontier. Thus "Eurasia" became politically and geographically one. About the same time the Tsarist autocracy became complete. There was a Parliament in Russia in the sixteenth and seventeenth centuries, a Parliament of clergy, nobles and townspeople. This body elected the first Tsar of the Romanov line, Michael, in 1613; and in 1649 it completed the process by which the feudal nobles had been steadily enslaving the peasantry. The reactionary condition of Russian society is seen in this fact, that, while in the seventeenth century serfdom in Western Europe was practically ceasing to exist or was being greatly diminished, in Russia the bonds of peasant servitude were being drawn closer. The Parliament of this year (1649) which imposed the civil code including serfdom was also the last Parliament of Russia for two hundred and fifty years. The Deputies did not like attending Parliament, and acquiesced when the Tsar ceased to summon them. This happened under Tsar Alexis, a pious gentleman and dignified ruler, whom Prince Mirsky calls "the last, and perhaps the best, incarnation of the harmonious equivoque of the Muscovite mind."

Light from the West.

Light from the West, chiefly regarding technical and administrative affairs, came in about 1669, when the high official, Artamon Matveyev, gave employment to Germans. Matveyev's Germanophile policy had great influence upon Peter the Great, who employed many foreign administrators and mercenaries. Peter's long and ultimately successful war with Sweden (1700-1721) ended with the annexation of the Baltic provinces, and so brought Russia physically further west. But most of his administrative reforms perished with him in 1725; and his attack upon old Muscovite manners merely brought "moral anarchy" into Russian high society and engendered the licence, of which he himself was such a glaring example.

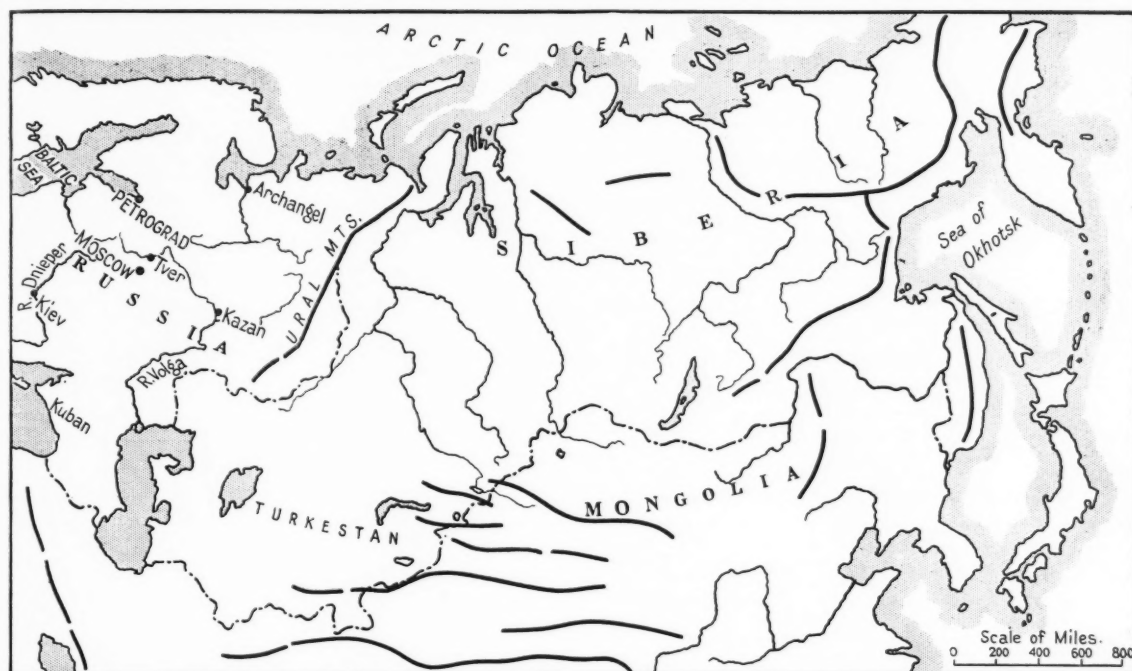
In the eighteenth century the stream of foreign culture coming into Russia was no longer German but French. Modern Russian literature may be said to have begun. The University of Moscow was founded in 1757. Education spread among the nobility and bourgeoisie. The reign of Catherine II (1762-1796), was "the golden age of the serf-owners." The enlightenment of this philosophic Empress did not inspire her to do anything for the peasants. The administration was made more uniform and systematic;

the huge Russian bureaucracy began to take its modern shape. Immense territorial extensions were made at the expense of Turkey and Poland. Thus the Western trend of Russia was made more definite; but the Russian people were still really outside the essential influences of the West; the French Revolution touched them not at all.

The Holy Alliance.

The most European in policy of all the Tsars was Alexander I, the creator of the famous Holy Alliance of Monarchs. His minister Speransky, who admired Napoleon and the Napoleonic régime, introduced French models and methods into the Russian bureaucracy. For a time the ally of Napoleon, Alexander, after the failure of Napoleon's Moscow expedition, followed the defeated French into Germany, and finally in 1814 to Paris. In the great Congress of Vienna which made the peace settlement, Russia stood out as a Great European Power. The Holy Alliance of 1815 was based on the brotherhood of European Monarchs. Unfortunately it set itself against Liberalism, the most characteristic movement among the European peoples in the early nineteenth century. Thus Russia came under the suspicion, in the eyes of Western Europe, of being the champion of autocracy and reaction. When the Tsar Nicholas I sent his army to prevent the secession of Hungary from Hapsburg Austria, in 1849, this suspicion was confirmed. In engaging in the Crimean War, five years later, France, Great Britain and Sardinia, held that they were not merely fighting for the integrity of Turkey, but that they were opposing the apostle of anti-nationalism and reaction.

The defeat of Russia in the Crimean War and the death of Nicholas I brought a period of iron despotism to an end. Under the rule of the humane and liberal Alexander II the serfs were freed, the civil and criminal codes were modernized, railways were constructed, provincial elective assemblies were established; Russia seemed at last on the road to becoming a normal European state, of the Western, liberal or "bourgeois," type. The most statesmanlike of the Tsars had just appointed a commission to make studies for a further move in the direction of constitutional reform, when he was killed by the bombs of revolutionary conspirators (1881). The succeeding monarch, Alexander III, and his advisors at once abandoned all idea of further reform. Alexander III, however, was peaceful, and was always on friendly relations with the other European monarchs. Russia grew in wealth and in intellectual culture, and might fairly have expected a liberal régime when the twentieth century opened.



RUSSIA IN EUROPE AND IN ASIA.

The reign of Nicholas II never fulfilled these hopes. First the extension of Russian influence into Manchuria provoked a disastrous war with Japan. The failure and the loss of prestige of the Imperial régime gave opportunity for the outbreak of a revolution in the year 1905. There were ten days of street fighting in Moscow. The Government triumphed after considerable bloodshed, but it seemed to have learned almost nothing. During the revolution the Tsar had promised to summon a Parliament or Duma with legislative authority. This promise was carried into effect, but the Duma was never allowed to become much more than a debating society.

In the years before the War, the Russian Government and, in general, Russian public opinion were strongly pan-Slavist. By this attitude, or policy, they contributed to the high tension of international feeling, the prominent feature of those dangerous years. When the war broke out the bureaucracy assumed the congenial task of taking into its control every department of the Russian national life. The bureaucracy struggled manfully but was not capable for the gigantic task. Defeat and exhaustion gave opportunity for the outbreak of Revolution in 1917; first the Liberal, next the Socialists, finally on October 25th, 1917, the Bolshevik Revolution.

The problem of Russia, namely, how its position in Eurasia can be adapted to normal relations in the

family of European states, remains apparently as far from solution as ever. But perhaps this is not really so. It is true that the Bolshevik Government has declared war upon the existing European economic and social system, and proclaims that it would like to see this overthrown; and by this attitude it has largely shut itself off from Europe. On the other hand, by acquiescing in the secession and independence of the non-Russian Baltic peoples and of Poland, Russia has made more possible than it was before, a peaceful condition of international affairs in Central Europe.

At present the Bolshevik Government, antagonistic to, and antagonized by, the rest of Europe, has turned its attention more and more towards the East; has reverted to a semi-Asiatic or Oriental outlook; has recognized Russia as being the land Eurasia, outside Europe. It may be, however, that this dual location, this Eurasian continuity of territory may provide the means of bridging the political and social gap between Europe and Asia. Modern means of communication have made the size of the world to shrink; international relations are closer than ever before and are world-wide. Europe is no longer a self-contained continent in international relations. In these world-wide international relations a healthy Russian state, planted firmly in Eurasia, could be a strong link and a bulwark of peace.

Was Wordsworth ever a Mystic ?

By George McLean Harper.

Professor of English in Princeton University, U.S.A.

Questioned in his old age about some lines from the "Intimations Ode," Wordsworth gave an explanation which implied that his youth was imbued with mysticism. Professor Harper, the well-known biographer of Wordsworth, questions this view by examining afresh the circumstances in which the lines were written.

WORDSWORTH is regarded by many as a high-priest of supernaturalism, a poet whose peculiar gift of imaginative insight gave him glimpses of a spiritual world of which the material world is only a garment. He is frequently quoted in support of idealistic systems of philosophy, some of which suggest or even proclaim that matter is a product of mind, others that it is merely a symbol or temporary representation of mind, and still others that it does not exist at all except in mind. These views undoubtedly give comfort to certain souls weary of what is impermanent and imperfect and longing for what cannot change or degenerate. It remains to be proved, however, that mind is more enduring or more perfect than matter. This problem is beyond the scope of ordinary mortals. But one may hope to throw some light on Wordsworth's relation to it.

Wide Misunderstanding.

There is no other great poet who is so much misunderstood. Most readers dip into his works here and there without noticing the dates of the poems. They attach equal weight to passages written forty or fifty years apart. They do not know the facts of his life, which was a stirring mental and moral drama, marked by tremendous changes of direction. To illustrate or reinforce some opinion, political, social, aesthetic, religious, or philosophical, they quote Wordsworth, not telling or perhaps even observing in what period the lines were composed. This is as if someone were to use an early utterance of Saul of Tarsus to prove that Paul the Apostle was not a Christian, or to cite Lincoln's Emancipation Proclamation of 1863 as evidence that he was an Abolitionist in 1855. In order to understand Wordsworth it is necessary to know the main facts of his life, especially his inner life. The chronology of his works is an absolutely indispensable thread for anyone who wishes to find his way through them understandingly. Wordsworth deliberately cut and tangled this thread by arranging his poems, in his later editions, according to an arbitrary classification, under various emotions and by species or kinds of verse-forms. It is a misleading arrangement, early

and late poems being in many cases printed side by side.

But the young and greater Wordsworth, the hopeful revolutionist, the pacifist, who "flourished" between 1792 and 1802, the bold and original explorer in philosophy and religion who survived for six or seven years longer, was a very different man from the cautious conservative, the militant patriot, the defender of accepted views, who replaced him and lived on till 1850, disapproving of him in part and yet not altogether unlike him. The two lives overlapped. Between 1802 and 1815 there was an exhausting struggle between them, and there are few if any spectacles in the whole range of literary biography more thrilling than this contest between the early and the later Wordsworth. From my window I see the tall trunk of a once splendid ash-tree which was stripped of its limbs in a storm several winters ago. If the tree had then died it would have left a happy memory of strength and gracefulness. But the sap continued running, and now a second growth of branches, miscellaneous in form and not symmetrical, though umbrageous enough, has shot up from the vigorous stump. It is the same and yet a different tree. Thus it was with Wordsworth. The tempest of common sense, conformity, utility, and other excellent but prosaic elements beat upon him sore between 1802 and 1815 and stripped off his boldest opinions and purposes.

Let us take, from three widely separated periods, three records of his thought on the relation between mind and matter. In *The Times Literary Supplement* for 27th May, 1926, was printed an account of a conversation between Wordsworth and Bonamy Price, which occurred presumably in July, 1844. Quoting the mysterious lines from the *Intimations Ode*,

Not for these I raise
The song of thanks and praise;
But for those obstinate questionings
Of sense and outward things,
Fallings from us, vanishings;
Blank misgivings of a Creature
Moving about in worlds not realized,
High instincts before which our mortal nature
Did tremble like a guilty Thing surprised,

Price asked Wordsworth what they meant, and gives the answer as follows: "The aged poet was walking in the middle; he at once raised his tall form erect, he passed in front of me and went up to a five-barred gate which lay in the wall that bounded the road. He then grasped it with his hands firmly, pushed against it with force, and then uttered these ever memorable words: 'There was a time when I was often forced to grasp, like this, something that resisted, to be sure that there was anything outside of me. This gate, this bar, this road, these trees fell away from me and vanished into thoughts. I was sure of the existence of mind; I had no sense of the existence of matter.'"

A World of Ideas.

The Rev. R. P. Graves, of Windermere, one of the adoring band of orthodox and conventional neighbours and visitors who tried to appropriate Wordsworth in his old age, hanging upon his lips and sometimes interpreting his utterances in their own sense, gave a similar account: "I remember Mr. Wordsworth saying that, at a particular stage of his mental progress, he used to be frequently so rapt into an unreal transcendental world of ideas that the external world seemed no longer to exist in relation to him, and he had to convince himself of its existence by clasping a tree or something that happened to be near him. I could not help connecting this fact with that obscure passage in his great *Ode on the Intimations of Immortality*." And then Mr. Graves quotes the lines cited above.

These anecdotes, even when every allowance is made for the orthodox desires and expectations of Price and Graves, may be accepted as showing that Wordsworth, just as, over seventy years of age, believed in the independent existence of mind or spirit, and that he thought he had entertained the same belief when he was young.

Forty years earlier, in 1804, writing the Third Book of *The Prelude*, he described a similar and yet significantly different state of feeling. Here he tells us that when he was a student at Cambridge he perceived a soul in material things:—

To every natural form, rock, fruit, or flower,
Even the loose stones that cover the highway,
I gave a moral life: I saw them feel,
Or linked them to some feeling: the great mass
Lay bedded in a quickening soul, and all
That I beheld respired with inward meaning.

The Ode, *Intimations of Immortality from Recollections of Early Childhood*, was begun in 1802 and finished in 1806. Its main subject is the vigour,

splendour, and freshness of a child's perceptions and the authority which this vision of the world ought to have over the life of the growing youth and the mature man. A secondary subject is the inference that the soul of the child comes from a previous existence equipped with powers to appreciate what it discovers here. The first subject has to do with matters of experience not altogether uncommon; the second with what may be called mystical or metaphysical speculations. The poet admitted that too much weight should not be attached to these latter. The Ode is loved by many readers. I have loved it from boyhood myself. But I understand it less and less as years go by; that is to say, I find it increasingly difficult to explain as a whole. And I have never seen an explanation that was satisfactory. One loves it for the beauty, especially the musical beauty, of many lines and passages, and for a vague suggestiveness which it exhales like a mysteriously sweet odour. I am far from wishing it were other than it is; but just to show how different this kind of poetry is from certain other kinds, let us try to imagine how inadequate a prose paraphrase of it would be, or what a sorry mess it would make if translated into French verse. The poem laughs at logic. Fortunately Wordsworth did not write or dictate a long explanation; perhaps he could not explain it fully, even to himself. The looseness of its construction suits the filmy, tenuous character of the ideas which it not so much expresses as suggests and evokes. We are thus reminded of the too often forgotten truth that poetry is primarily music; and music rarely tells a story or teaches a lesson.

Everyday Things.

The years 1797 and 1798 were the great years of Wordsworth's mental and moral growth and also of his poetical originality, the years when he was most individual in his purposes and methods. It may seem contradictory to say that this was the time when he lived in the most intimate spiritual communion with Coleridge. Then it was, too, that the quick eyes of his sister Dorothy were most actively foraging the world of little things, the world of daily experience, for incidents and objects that might serve these young poets as material for composition. It was at this time that Wordsworth wrote the first draft of a poem which was intended to be a companion piece to Coleridge's *Rime of the Ancient Mariner*. Their plan was that Coleridge should treat a supposedly supernatural event with such attention to natural detail as to produce an effect of reality, while Wordsworth was to choose a subject from real or

common life and throw over it a glamour as of the supernatural. Wordsworth accordingly wrote the poem called *Peter Bell*, which was a very different thing originally from what it became before he finally published it, after cautious revision, more than twenty years later.

"Peter Bell."

In the Prologue to *Peter Bell* three stanzas still stand which express Wordsworth's purpose in writing the poem, as mentioned above. They are based upon his political doctrine of human equality and are furthermore an aesthetic and religious creed. He will be satisfied with the material which common everyday life supplies to a poet or seeing man. Nature alone, with no help from theology, no supernatural revelation, no interference from outside, is sufficient to make man good and great and happy. This may or may not be a sound creed (I think it is not), but it was Wordsworth's at the age of twenty-eight. The stanzas are as follows:—

Long have I loved what I behold,
The night that calms, the day that cheers;
The common growth of mother-earth
Suffices me—her tears, her mirth,
Her humblest mirth and tears.

The dragon's wing, the magic ring,
I shall not covet for my dower,
If I along that lowly way
With sympathetic heart may stray,
And with a soul of power.

These given, what more need I desire
To stir, to soothe, or elevate?
What nobler marvels than the mind
May in life's daily prospect find,
May find or there create?

I do not believe that in the period of his life when he wrote those lines he felt impelled to grasp trees or gates in order to make sure they existed. He was then a professed rationalist, interpreting life from the facts of experience and content, for the time being, not to look for anything else. This is the most satisfactory period of his career: he was consistent, original, brave, and gloriously productive. If he had had enough "natural piety," that is, reverence for his youthful ideals, to stick to this creed through the trying years of the Napoleonic wars, he would have seemed very impious, no doubt, to some of those who formed the circle at Rydal between 1815 and 1850, and his biographers would have had a less puzzling task, and English poetry would have been the poorer by some magnificent lines, and Church and State would have lacked his support; but the

promise made in *Lyrical Ballads* might have been even more richly fulfilled than it has been. That promise is condensed in the stanzas just quoted from *Peter Bell*.

A poet, of all men, ought to know that matter exists. It is his calling to see in nature much that is hidden from other men and to present it in its beauty. If he wishes to go farther and declare that either in nature or behind nature there is a soul, the way is open to him; but he must first be aware of nature and in love with her. In a letter to Professor Henry Reed, of Philadelphia, written in 1845, Wordsworth declared that what he most valued in his poetical attempts was the spirituality with which he had endeavoured to invest the material universe, and the moral relations under which he had wished to exhibit its most ordinary appearances. This surely was a worthy purpose and was nobly carried out; but it is not what is generally called mysticism; at least it is not unusual or peculiar to poets or specially Wordsworthian. Paradoxical as it may seem to say so, Wordsworth was more of a mystic when he was most conscious of the reality of matter and most interested in its variety and beauty. This was in his early days; and of his faith at that time we have an amazing confession in the *Lines composed a few Miles above Tintern Abbey*, in 1798, where he is bold enough to say of himself "I am

well pleased to recognize
In nature and the language of the sense
The anchor of my purest thoughts, the nurse,
The guide, the guardian of my heart, and soul
Of all my moral being."

Nothing more unorthodox could be imagined. It is a frank abandonment of the belief, old as the memory of mankind, that God and nature are separate, that soul and body are distinct, that matter has no mind. This attitude alarmed the more theologically trained Coleridge, who expressed regret that his new friend Wordsworth was "a semi-atheist." If any other readers of the poem when it first appeared really understood the full significance of the words they must have been shocked. If they were personally acquainted with the poet they must have known him to be extremely exact and scrupulous in his use of language. It will not do, even at this late day and in view of his subsequent conversion, for us to say, "Ah well, he only meant that he perceived and worshipped God in nature." He was far too downright and honest to have said one thing and meant another so different from it. He really believed and declared that nature was itself divine.

Wireless as an Aid to Navigation.

By Lt.-Col. Chetwode Crawley, M.I.E.E.

Deputy Inspector of Wireless, G.P.O.

Great progress has been made in the technique of wireless communication during the last two years, principally due to the use of "short wave" transmission, but the advance in wireless as an aid to navigation, though quite as impressive, is much less widely appreciated.

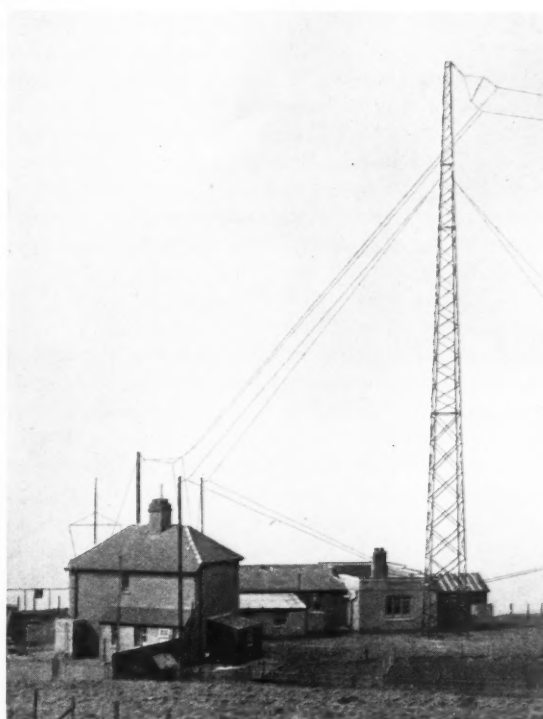
THE results of Mr. Marconi's earliest experiments clearly foreshadowed the application of wireless signalling to the needs of navigation, but the wider field of commercial communication led to development along other lines. In his first practical signalling experiments Marconi transmitted the signals in the form of a beam of waves, similar to the light beam of a searchlight, and it is obvious that these waves could be utilized for navigational purposes, as a ship which received the signals would know that it was in the path of the beam, and therefore on a known bearing from the transmitting station. But the drawback of this method of transmission was that reflectors had to be used at the sending station, and these reflectors were only effective if waves of very short length were employed. Such waves, however, were only suitable, with the knowledge then available, for reception over very short distances, and the paramount importance of wireless signalling over long distances altered the whole course of development into another channel. Short waves and reflectors were completely discarded, and for twenty years wireless engineers concentrated on the development of communication by long waves over great distances.

But Marconi never quite lost sight of his early beams, and he returned to the old ideas for experiments in connexion with some problems which arose during the war. From these experiments has been developed the short wave beam system which has revolutionized the whole outlook of wireless communication during the last two years. These short wave beams, however, have not yet been adapted commercially to navigational purposes, though the Marconi Company have erected two experimentally to assist the navigation of ships, one in the Firth of Forth, and the other at the South Foreland in Kent.

At these stations the transmitting aerial is mounted on a revolving carriage fitted with wire reflectors, so that a rotating beam of waves is transmitted. When the beam rotates distinctive signals are made as it passes through the different points of the compass. The ship merely listens to the signals and makes a note of the strongest signal heard. The bearing represented by this signal is the bearing of the station

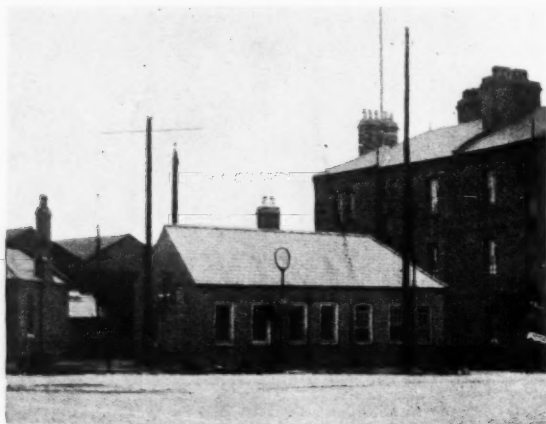
from the ship. The practical drawback to this system is that only very short waves can be used, and at these particular stations a wave of about six metres is employed. Such short waves are not at present practicable for the communication of ships over long distances, and a ship's ordinary receiving apparatus cannot receive them. This means that any ship which intends to make use of such stations must be specially fitted for the purpose, and as the system has not been generally adopted shipowners do not feel justified in going to the expense of installing this special apparatus. Ships can obtain a bearing from stations on this system up to a range of about fifty miles.

The idea of a rotating wireless transmitter is



DIRECTIONAL RECEIVING AERIAL.

The wireless coast station at Portpatrick, showing the directional receiving aerial of the fixed double loop type, two large loops, each of a single wire, being used. The screening arrangements used in ships are not here necessary, and there is plenty of room for a large loop which increases the sensitivity of reception.



THE LIVERPOOL COAST STATION.

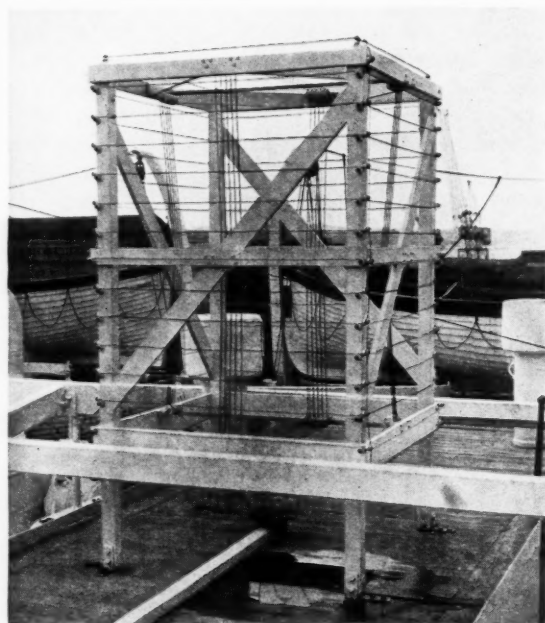
The station is in the centre building, where the small revolving loop of a directional receiving aerial is seen.

very attractive provided that the signals can be received on the ship's ordinary apparatus, and the Radio Research Board is developing a beacon on these lines. A station for trial with ships is now being erected by the Government at Orfordness. At this station the aerial will consist of a vertical closed loop which will be made to rotate at a uniform speed of one revolution a minute, the emission of wireless waves taking place in the plane of the loop. A signal of constant radiation is sent out throughout the whole period of operation except when the loop is in a North-South or East-West plane, when characteristic distinguishing signals are sent. The strength of the signal, as received by the ship, varies from a minimum when the plane of the station's aerial loop is at right angles to the ship's line of bearing from the station, up to a maximum when the aerial loop comes into line with this bearing. The ship receives the signal on its ordinary receiving apparatus, and the only special instrument required for calculating the bearing is a stop watch, which the operator starts when one of the characteristic signals is received and stops when the emission is heard weakest. In practice, of course, the operator goes through this operation a number of times and takes the mean of his observations as the correct bearing. Preliminary tests with this form of beacon, using ships' ordinary waves, have shown that the bearings are sufficiently accurate for ships' navigational purposes up to a range of about fifty miles, and for aircrafts' navigational purposes up to about two hundred miles.

The outstanding advantage of this type of beacon—and it is an advantage of the greatest importance—is that the ship requires no special receiving apparatus; but it is much more costly than an all-round beacon,

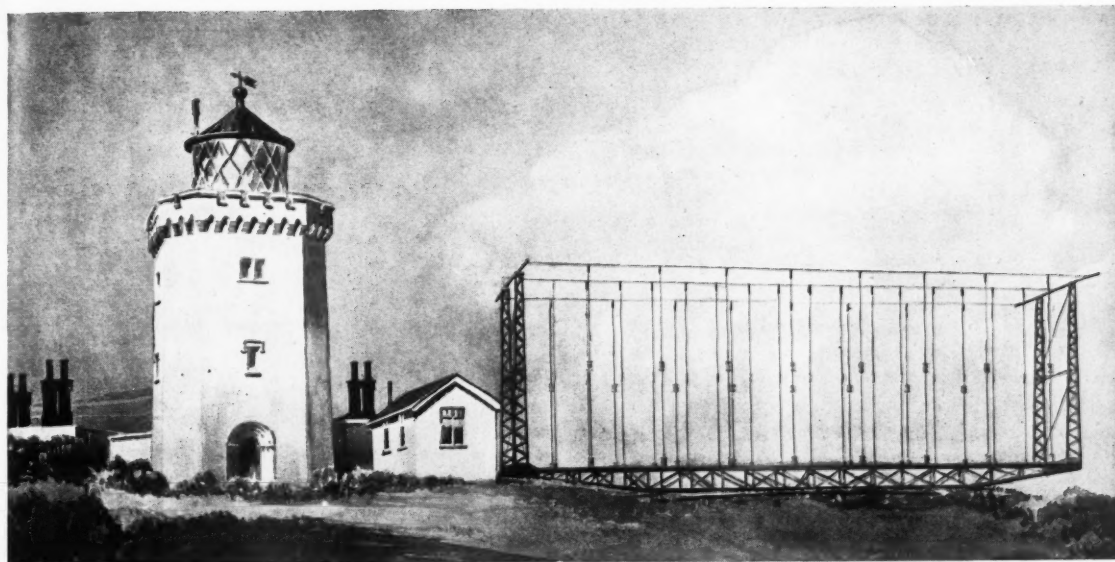
requires more attention in operation, and, owing to the space required, is not adapted for installing in lightships, which are often suitable places for wireless beacons from the navigational point of view.

An all-round wireless beacon is one which sends out wireless signals of the same strength simultaneously in all directions, and can be made use of only by those ships which are fitted with directional receiving apparatus. Of the British ships now equipped with wireless only fifteen per cent are fitted with this special apparatus, but this percentage will no doubt increase rapidly as the number of beacons on shore is increased, and as shipowners become more impressed with the potentialities of these directional receivers. Not only can such receivers be used for obtaining bearings from wireless beacon stations, but they can be used for obtaining bearings from any ships or stations which transmit signals on the wave-lengths used for ships' communications. Under normal conditions the bearings so obtained, up to one hundred miles or so, are sufficiently accurate for the purposes of navigation. When conditions are not normal, and bearings unreliable, the operator is aware of the fact in nine cases out of ten. There is, of course, the danger of this tenth case, but its possibility being known its real danger is to some extent discountenanced, as



AERIAL FITTED IN A SHIP.

This directional receiving aerial is of the fixed double loop type, each loop consisting of five wires. The whole system is enclosed in a wire screen, which reduces the possibility of inaccuracies arising through the movement of derricks or similar metal bodies in the vicinity. It is analogous to the metal screen round a compass.



A SHORT WAVE ROTATING BEACON.

Two short wave rotating beacons of the Marconi Company have been erected, one at South Foreland and the other in the Firth of Forth. The aerial and reflecting wires are shown mounted on the carriage which is capable of revolving. During the operation of the beacon the carriage revolves continually and so emits a rotating beam of wireless waves.

the navigator will not look on his wireless bearings as infallible.

Three different systems of directional reception are at present used in ships, *viz.*, the fixed double loop, the rotating double loop, and the single loop. In the fixed double loop system, the aerial consists of two vertical loops in planes at right angles to one another, and the operator rotates a coil in the receiving apparatus. This varies the strength of the signals, and the direction from which they come can be determined from the position of the coil when the signals are at their weakest.

In the rotating double loop system, the aerial itself, which is similar though much smaller, is rotated by the operator who notes its position when the strength of signals is unaffected by reversing, with a switch, the connexions of the loops. The direction from which the signals are coming is determined by this position.

In the single loop system, the aerial, which consists of a small single loop, is rotated, and the direction from which the signals are coming is determined by the position of the loop when they are heard at their weakest.

The bearing obtained by the wireless operator is the bearing of the station relative to the direction in which the ship's head is pointing at the time, and depends therefore for its correct interpretation on the correctness of the compass reading when the

observation is taken. All this sounds rather difficult and complicated, but the fact remains that a ship's operator, after a little practice, can give the navigating officer the bearing of a wireless station, or another ship fitted with wireless, within about two degrees, and it is seldom indeed that the navigator is not satisfied with that degree of accuracy.

Aircraft are sometimes fitted with directional receivers, but the necessary economy of space militates against the general adoption of additional apparatus. All important aerodromes are, however, equipped with directional receivers, so that aircraft can obtain their bearing from an aerodrome on request.

It has recently been decided to go ahead with the erection of all-round wireless beacons at various places on the coast. A dozen places have been selected by the authorities concerned, and at five of these the beacons have already been erected and are in operation. These are installed in lighthouses or lightships at Spurn Head in the Humber, Liverpool, the Skerries at Holyhead, Lundy Island, the Casquets and the Scillies. Each beacon has a distinctive call signal which it broadcasts automatically for definite periods at definite times on a 1,000 metres wave which is allocated internationally for this particular service. Ships fitted with directional receivers can obtain bearings from these stations up to ranges of between fifty and a hundred miles. The beacons at Spurn Head and Liverpool also send out submarine

sound signals which, in conjunction with the wireless signals, enables a ship to calculate its distance from the beacon as well as its bearing. The advantage of this from the navigational point of view is obvious, but such stations are, of course, more expensive to instal and operate than the simple wireless beacons.

Present Facilities.

These all-round beacons, as already mentioned, are only of use to ships which are fitted with directional receivers, *i.e.*, at present only fifteen per cent of British ships fitted with wireless, and the rotating beacons, which could be used by all ships equipped with wireless, have not yet emerged from the experimental stage. The only facilities, therefore, available at present for the great majority of ships are those provided by the Post Office coast wireless stations, which were primarily established for communication between ships and the shore, and in addition one station provided by the Admiralty at the Lizard in Cornwall. The Post Office stations are spaced round the coasts so that no ship, however small, in the vicinity of the British Islands can fail to be in touch with one or more of them. All these stations are not, however, technically suited for giving bearings to ships, that is to say, the positions of some of them are such that the bearings given would be unreliable in all directions, the positions having been chosen with a view to communication and not to navigation.

Those suitable for giving bearings are the stations at Wick, Cullercoats, the Humber, Niton, Portpatrick and Malin Head. The first four have been giving bearings for some time, and the last two will be available very shortly. The stations are carefully calibrated every year, and those sectors in which bearings may be unreliable are published for the information of shipping. In any case the operator at the station informs the ship if he considers that there may be any doubt about the accuracy of the bearing, so that unless the ship is told to the contrary it may be confident that the bearing is accurate within about two degrees. When a ship requires its bearing from one of these stations it informs the station and then sends its call signal continuously for one minute. The station, with its directional receiver, notes the direction from which the signals come, and communicates this bearing to the ship. The 600 metres wave is used for this work at all stations, except at the Lizard where the 800 metres wave is employed, and a charge of five shillings is made for each bearing given. If the ship is distant over one hundred miles

the bearing cannot be guaranteed as within the usual degree of accuracy, and at night, especially about dawn and sunset, bearings are often not so reliable as in the daytime.

Occasionally, as in some parts of the English Channel, when bearings can be obtained from French as well as British stations, it is possible for a ship to obtain two bearings and so plot its position on the chart at the intersection of the lines of bearing. Last year about nine thousand bearings were given to ships by our coast stations.

Ships fitted with directional receivers can, of course, obtain a bearing from any coast station. In this case the station sends its call signal for one minute, and the ship takes the bearing. A charge of five shillings is made for each one minute period of sending.

Generally speaking, the bearings taken at coast stations are more reliable than those taken in ships. In ships there is the possibility of errors creeping in due to a change in the positions of guys, derricks and the like, there are fewer opportunities for taking check bearings, and there is the possibility of an error arising in having to refer the observation taken to the direction of the ship's head as shown by the compass at the time. On the other hand, a ship can go on taking as many bearings as it likes on a beacon station, and there is, too, the psychological advantage that the ultimate responsibility for the bearing rests with the ship, which after all is chiefly concerned, and not with the shore station, which may not be in a position to appreciate all the circumstances of the case.

Shooting by Searchlight.

CAPTAIN WILKINS'S new book, "Undiscovered Australia" (Benn, 12s. 6d.), describes an expedition made into the wilds of the continent on behalf of the British Museum. The chief object of the party was to collect specimens of the native fauna, and in certain cases the use of a searchlight was enlisted for shooting nocturnal animals. (See our cover photograph.) The adventures met with included a visit to aboriginal tribes who still practice cannibalism, and there are interesting descriptions of their life and customs. In regard to the future, Sir Hubert Wilkins says:—"If use be made of organized and applied science, there is a golden future for Australia . . . the fact that I am the son of a father who was born in South Australia in 1836 has given me courage to draw attention to some things which my countrymen may not be pleased to hear." The book, in fact, is more than a valuable travel record: it forms an outspoken contribution to the problems of a great Dominion.

The Romance of the Beaver.

By Sigvald Salvesen.

Naturalist at Arendal, Norway.

A Norwegian here pleads for the wider protection of the beaver, which in Norway has been saved from extinction by law. Colonies are spreading again throughout Scandinavia where, as in other countries, the beaver may prove under modern breeding methods a source of fur more valuable than hitherto.

BEAVERS inhabited practically every part of Norway in earlier times. They swarmed in the numerous rivers and marshes of Finmarken and Nordland; they were plentiful in Troendelagen, where probably the largest colonies of beavers existed, and even found their way into the backwoods of the eastern parts of the country. Some years ago, during cultivation of a marsh at Tveit, in Aamli, old aspen-tree logs indented by the beavers' chisel-like teeth were found about three feet below the surface of the ground, and other fragmentary evidence testifies

that beavers were plentiful in Norway in ancient times. The old name for the beaver is *Bjor*, which is still used in the parts of the country where the animal survives. Many old names of lakes, farms, etc., connected with beaver are still used, for example, Bjorli, Bjorvatten, and Bjorstem.

The fur of the beaver has always been in great demand, and in the Customs reports of as long ago as 1300 it was one of the most important of exported furs. Even in the time of the Vikings, beaver fur was exported to foreign countries. The increase in population, the march of civilization, and the needs of agriculture had much to do with the disappearance of the beaver. As the lodges, tracks, dams, and other results of their cutting and digging operations were visible, the beavers' houses were easily found and the keen little dam-builders trapped or killed. Gradually they disappeared from the woods of Norway. In about 1750 they were extinct in many districts and everywhere decreasing in number. The last beaver in

Finmarken was killed some seventy years ago, and in Nordland in 1865, while perhaps epizootic diseases also had something to do with their decrease in numbers.

The last survivors comprised a few colonies left in

the south-eastern part of the country, especially in Aamli along the River Nidelven. In 1883, when the late Professor Robert Collett of Oslo realized the danger of the beavers' disappearance from the country, it was thought that only one hundred beavers were left. He therefore called public attention to the fact; and as

a result of his efforts the beavers were totally protected in 1899. From that time the animals have steadily increased in number, and are spreading over greater and greater areas. There are now supposed to be 12,000-14,000 beavers in the country, which are to be found in Telemarken, Aust-Agder, Vest-Agder and Rogaland counties, in Telemark in western Norway and in Rogaland in the east. The beaver is still totally protected in the border districts of his domain, but in the central area an open season is allowed in the autumn.

For many years past I have had an opportunity of following the invasion of beavers into new areas. The beavers in Aamli were at first only to be found in the River Nidelven, but gradually they were spreading over a wider area following the courses of numerous rivers, creeks, and streams to the countless lakes and ponds in the woodlands. During the first few years we did not see very much of the immigrants. Now and then one might see foliferous trees cut here



A BEAVER LODGE.

The lodge (seen on the right) consists of branches propped in triangular fashion against a tree-trunk and covered with sticks. Part is under water and there are two entrances.

and there along the shores, and twigs and branches cut and transported to the water. The animals apparently hesitated to construct lodges, temporarily living in dugouts in the banks.

One autumn I noticed that a pile of mud and sticks had been heaped up close to the shore, under a big spruce. The sticks were stripped of bark and cut off as if by a sharp knife; the mud must have been taken from the bottom of the lake, as tufts of bottom grass with its roots were mixed with it. A fortnight later the heap was increased to a big dome which stretched several yards both up the slanting shore and below the surface of the water. The cupola was peaked—in vertical section nearly triangular—the base being about three yards and the length possibly six yards. I could see the entrance among the twigs and branches under the water, and was astounded that the work had been finished in such a short time. As there had not been sufficient twigs and branches remaining from the meals, any other old sticks had been used.

In order to get a room large enough both for living and eating in during the long winter season, the beavers hollow a cavity out from the inner part of the mudheap. They cut off the sticks and dig out the mud and even the surface of the walls and roof with their forepaws. The entrance to the room runs from under the water sloping more or less as the shore does. The upper part of the room is used as a sleeping room, the bed being made of grass and shredded wood. When eating, the beaver sits close to water so that he may wet the food before eating it; only in winter he eats in the lodge. He then takes the food from the pile of twigs and branches of foliferous trees placed in front of the hut late in the autumn; and having gnawed the bark off the sticks, he takes them out of the lodge.

As the family increases, more room is essential. In this case more sticks and mud are placed all over the outer sides of the lodge and the inner room made greater. As a rule the youngsters keep to their home lodge until their second or third year. There may therefore be several inhabitants in one single lodge, since the beavers pair for life and exhibit much devotion to each other.

The beaver sometimes does not cut a tree but only blazes or marks it with his teeth. This is probably done to test the condition of the bark, to see whether the tree is ready for being cut and stored. Large trees are cut in the shape of two pencils standing against each other. The beaver is very fond

of the roots of water lilies, although aspen seems to be a favourite food, preferred to all other timber. I have seen aspen trees up to one and a half feet in diameter and fifty-six feet high cut down and all but the trunk utilized for food or building. The smaller trees are usually "logged up" and transported; the animals taking a portion and dragging it between their forelegs, with the result that regular transport roads are often formed.

In Nissendal a pair of beavers I observed had built their lodge only a little over a hundred yards from a farm. Unfortunately the beavers found that the apple trees in the orchard were splendid food; and they cut down several in one night, some of them standing only five yards from the farmhouse. In places where little foliferous trees are to be found, it is good policy to plant plenty of willows, which grow very rapidly. The beaver very seldom cuts down small acicular trees, and then only when they obstruct his way or when he uses them for building. Where the lodge lies in a suitable place, one may feed the beavers with turnip, potatoes, etc., as a supplement.



THE NORWEGIAN BEAVER.

This photograph, taken by the author, shows clearly the beaver's flat swimming tail and webbed feet.



A BEAVERS' VICTIM.

Large oak tree in Hanesdal cut almost through by beavers.

Late in the autumn, just before the frosts begin to be severe, I have noticed that nearly all the surface of the hut had been covered with fresh mud. During the summer, much of the old mud had been washed away by rain, and now the clever little house-builders laid on a new cover. When this was frozen, it was an excellent protection against cold and possible enemies that would try to reach them in their warm nest. When deep snow covers the ground, it is very difficult to see where a beaver family has its home. By examining the top of the dome, slight traces of steam might perhaps be seen rising from the top in the cold fresh air. Beavers can swim considerable distances under the ice, their lungs being of large size to retain air for several minutes, so that the entrance in the ice where he takes in food may be a long way from the lodge. They have a splendid appetite during the winter; for in the spring white sticks, the remains of the winter's feasts, can be seen floating all over

the ponds near the lodges. Earlier in the spring, these sticks can be seen close under the ice.

The most striking work done by the beavers is the construction of dams, which can be seen in many places in southern Norway. I have followed the construction from the beginning in several places. One of the most typical I found was in Hanesdal, a remote valley stretching to the north-west, just below the Suplandsfoss waterfall by Simonstad in Aamli. A very small stream flows down the valley from some marshes farther up. Many kinds of foliferous trees suitable for beaver food were growing on high hillocks on each side of the valley. Although there was no pond in which the beavers might build their lodges, they knew how to manage affairs! By taking up mud from the bottom of the stream and mixing this with sticks and turf they made a dam across the valley. The dam followed suitable points of support as big stones, trees, etc., so that it zigzagged along its course. The top of the dam was so even that the water overflowed evenly along the whole length. As soon as the dam was ready, the animals began constructing a lodge on a suitable place in

the pond. Some years later, all the foliferous trees around the pond were eaten, so the beavers abandoned the locality, and some of them went up and some down the Hanesdal to found new "cities." The beavers returned there, repairing the dam and lodge, when new wood had grown up round the old pond.

The beavers often construct two or three smaller dams below the main dam. The surface of the water in that nearest to the main dam rises above the bottom of that dam, and similarly that in the second above that of the first, etc. This, I suppose, is done because

the animals know that in flood times the water running over the top of the main dam would undermine it.

The little teal (*annas crecca*) apparently finds a good living in the beaver ponds, as I have very often found this little creature swimming around in the brown, muddy water eagerly searching for food. There are plenty of larvae, toads, etc., in the calm water of the pond. Also the blackbird is often to be



BEAVER DAM IN HANESDAL.

The sticks and turf are closely fixed with the aid of mud from the bottom of the stream. A beaver lodge is seen behind on the left.

found around the pond, and I have noticed sometimes that the bird has given its warning cry before the beavers have seen me coming. But then the beaver promptly gave his warning splash.

As a rule the beaver is very shy and hides in the water as soon as possible when frightened. In places where he is much disturbed, he therefore only works at night. When repairing the dam, they have a watchman on the top while the others are working, who if frightened at once jumps into the water, making the warning splash. The other beavers immediately dive and make for the lodge, or lie under the water, with the nose only above the surface. In this position they are nearly invisible.

Many stories could be told about the beavers' astonishing engineering undertakings, which are so remarkable that one would not think an animal capable of them.

The beaver, in fact, is such an interesting animal that it should be preserved in every country where it is to be found. In olden times the beaver inhabited a very great area in both the old and new worlds, but as the land became cultivated, they became nearly

extinct. No one cared for this interesting little animal and they were not considered game worthy to be protected. For example, in their book "Die Säugetiere" about the beaver, the German zoologists, Carl Vogt and Friedrich Specht, say:—"Except in isolated rivers, where fanciers of these animals have given a sanctuary to some small colonies, the beaver is *fortunately* quite eradicated all over the cultivated Europe. No doubt, some authors have set up sentimental lamentations over its extermination. However, it must be admitted that the beaver is one of the most harmful creatures to the woods, and we need indeed wood materials more than beaver skin and castoreum!" Fortunately the opinion has now altered in most countries in favour of preserving nature and wild life. Of course, beavers cannot inhabit places where the country is much cultivated, since

they may do great harm to property. The beaver can, however, easily be kept within certain areas, as he is an easy prey for skilled trappers. In the more remote areas of woodland it would no doubt pay to keep beaver colonies for producing fur.

Both in the United States and Canada beaver farming is steadily increasing. In Norway also several attempts have been made to transplant beavers to the northern part of the country, and many have been sent to Swedish national parks, where they are multiplying fast. With the modern methods of breeding fur-bearing animals, the beaver in the future may become a more common animal in several countries than at the present time. People will learn that it is not economical to exterminate this interesting animal which adds romance to the woods, and can also pay a good rent in the shape of fine lasting furs.

The Future of our National Collections.

By E. N. Fallaize.

Honorary Secretary, Royal Anthropological Institute.

After dealing with the main issues now before the Royal Commission, which are of first importance to public education in its widest sense, Mr. Fallaize discloses plans for the future of our ethnographical collections.

Specimens are becoming rarer day by day before the advance of European civilization.

It was at one time almost an article of faith in party politics that any inconvenient question might be most expeditiously and effectively buried by the appointment of a Royal Commission. It is devoutly to be hoped that a kinder fate may attend the problem of our National Museums and Collections upon which a Royal Commission has been sitting since the summer of 1927. Although the Commission has not yet reached the end of its deliberations, it has recognized the extreme urgency of some of the questions which have come before it by issuing in September last an interim report.

The Commission was appointed by Royal Warrant on 1st July, 1927. It consisted of Viscount D'Abernon, Chairman, The Hon. Evan E. Charteris, Sir Thomas Little Heath, Sir Lionel Earle, Sir Richard Glazebrook, Sir George MacDonald, Sir Courtauld Thomson, Sir W. Martin Conway, Sir Henry A. Miers, Sir Robert Clermont Witt, and Dr. Arthur E. Cowley. It will be agreed that the Commissioners formed a strong body, covering a wide field of interest and specialized knowledge. This was demanded both by the variety of institutions in England and Scotland which had been included under the category of "National," and by the terms of reference.

The institutions under review were nineteen in

number, or rather twenty, as the Scottish National Galleries are really two separate institutions. They included the British Museum and the Natural History Museum, the National, Portrait and Tate Galleries, the Record Office, the Victoria and Albert, the Bethnal Green, Science, Geological, London, and Imperial War Museums, the Botanic Gardens at Kew, the Wallace Collection, and in Scotland the Royal Scottish Museum, the National Galleries, the Scottish Museum of Antiquities, the National Library, and the Record Department of the Registry House.

It is evident that even to obtain a knowledge of the varied contents and the working of these institutions was a formidable task; but when the terms of reference are considered it must seem truly remarkable that the Commission should be so far advanced as even to publish an interim report after sitting for only a little over a year. In justifying its action on the ground of the delay that must supervene before the final report can be issued, the Commission is guilty of no exaggeration.

The terms of reference covered in the first place the legal position, organization, administration, structural condition of buildings, and cost—that is, clearly, cost of maintenance—of the collections. By this was meant of the collections as they stand, for

the Commission was asked next to enquire into the rate of growth and consequent increase in expenditure during the next fifty years if present practice is continued. At the same time the possibility of economies without detriment to the institutions was to be considered, as well as the question of a charge for admission as a source of income. Further, the question of the arrangement of the collections and their distribution and of congestion had to be taken into account, and whether specimens either of slight importance or in excess of requirements might be disposed of by sale or by loan to other institutions.

In addition, certain limitations and legal requirements, of which the public has heard from time to time as the cause of difficulty, were mentioned for consideration. The provision of the Copyright Acts, whereby the British Museum receives for preservation a copy of all publications seeking the protection of the Acts, has frequently been cited as a cause of much expenditure of time, storage space, and money, in the Department of Printed Books. The bequests of benefactors, especially to the National Gallery, have also sometimes interfered with what has been felt to be the most effective and appropriate allocation for exhibition and study.

The Commissioners were required further "to make recommendations generally which may suggest themselves as pertinent in the light of information obtained during the course of the enquiry."

From the terms of reference two points emerge. Firstly that there was no doubt in the mind of the authorities responsible for finance of some hope of possible economies in the upkeep of the national collections as they stand at present, and secondly that there were certain questions relating to these collections which needed ventilation.

The Problem of Congestion.

It has long been known to a fairly wide circle, which is keenly interested in the national institutions and anxious that the greatest possible benefit should accrue to the public from what are its possessions, that all was not well with them. No one was more fully aware of this than the officials themselves to whom they are entrusted. Apart from the fact that museums and galleries are by no means adequately staffed, in particular they suffer from congestion. This is perhaps their most serious problem. The exhibits are overcrowded, nor are they displayed to the best advantage, either aesthetically, scientifically or educationally. What is more, a great deal of valuable material is not shown at all and cannot even be made accessible to accredited students. This has been fully

brought home to the Commissioners. It is owing to the urgency of the problem that an interim report has been published which deals largely with the question of accommodation.

From many points of view the British Museum presents the most serious problem, especially as regards the Library. The Natural History Museum has strong claims on the ground of the necessity of more adequate space for scientific arrangement, and as has been emphatically pointed out by the Royal Society, provision for research workers is urgently needed. Of the South Kensington collections, in the view of some authorities, certain sections should be entirely reorganized, especially in connexion with Indian exhibits. It is unnecessary to go through the list. Nearly every one of the collections here considered has a strong case to urge.

Extension Schemes.

Of the London institutions, several have schemes of extension in readiness. The National and Portrait Galleries should ultimately occupy the vacant spaces at the rear of the existing buildings, taking up the whole of the block to the north of Trafalgar Square. The British Museum also has a scheme of extension, and has already attempted to cope with the difficulties of the Department of Printed Books by a Repository at Hendon, to which the Commissioners now suggest that the whole of the newspaper and periodical section should be transferred.

All these schemes have been under review by the Commission. It is pointed out that their cost would be considerable. Accordingly alternatives are suggested in the Interim Report which could be effected at a considerable saving, say, not less than at £800,000. It is estimated that the needs of the National collections for the next fifty years could be met by a provision of £779,000, spread over a term of twelve to fifteen years, and involving an average annual expenditure of £52,000, which would not exceed £130,000 in any one year. Relatively to our annual national expenditure this seems a small amount; but it must be realized that the need for immediate action is very great. It is not possible to deal here with arguments in detail, but there is one point which calls for mention.

It has been suggested that the British Museum might be allowed to deal with the difficulty of storing printed books and periodical literature imposed upon it by the Copyright Acts by a system of selection. The Commissioners do not view this proposal with favour. A staff of expert selectors would be required whose salaries would absorb any possible economies, while it is justly pointed out that it is impossible to

forecast that any item may not become of interest or be required in the future. The value of chapbooks and broadsheets at the present day, not merely as antiquarian curiosities, but as documents in social history, may serve to support this view.

Although the Commissioners in the Interim Report have as their main subject the question of accommodation, they cover a great deal of ground which is of more general import. This is not irrelevant, however, for it has a very direct bearing upon the question of cost involved in any suggested extension. Taking the institutions one by one, the Report outlines their history and shows how greatly the nation is indebted to private benefactors and to private initiative for these great collections which now are of almost incalculable value and one of the greatest of the assets in our national wealth. The British Museum, as is well known, began with the bequest of Sir Hans Sloane, from whose trustees it was purchased under the terms of his will for, at the most, a quarter its money value. With the Sloane collections were incorporated the Cottonian and Harleian manuscripts and documents, originally the property of private individuals. In the same way the National Gallery, the Tate Gallery, the Wallace Collection, the National Library of Scotland, and the Scottish Museum of Antiquities, to name some only, arose out of private enterprise, while the collections at South Kensington were due to the foresight and keen interest of the Prince Consort. Nor is this private benefaction a matter of the past only. During the last five years the value of private gifts to the British Museum has been in the neighbourhood of £40,000 a year, as compared with the purchase grant of £25,000, and in the Victoria and Albert Museum the annual gifts have averaged £24,000, as compared with the purchase grant of £16,000. Further, the buildings of the Tate Gallery, the National Portrait Gallery, the London Museum, the Scottish National Portrait Gallery, and the Scottish Museum of Antiquities, have all been provided by private individuals. To put it colloquially the nation has had a bargain. For how does its contribution compare with that of the private donor? Economy has been pushed to the point of endangering efficiency.

National Education.

The Commissioners point out that whereas one hundred years ago subventions were already being given to such national collections as existed at that date, such as the British Museum and the National Gallery, grants in aid of elementary education were not made until 1832. Yet now the museums, as the Commissioners put it, are "the Cinderella of the

social services." Nevertheless it is recognized that these institutions perform a function of the highest importance in the national system of education and their utility could be very greatly extended. The British Museum "has probably done more for research, for the advancement of learning, for the study of civilization and of science, than any single institution of its kind at present existing in the world." Yet, on the other hand, "it is difficult not to feel, whether from the standpoint of material or of spiritual values, that the immense capital represented by the national collections is not bringing in the maximum return."

Proposed Ethnographic Museum.

In dealing with the needs of the institutions under review, the Commissioners have purposely reserved the question of the ethnographical collections in the British Museum, but they quote with approval the opinion of the Council of the Royal Anthropological Institute which emphasizes the lack of an Imperial Ethnographic Museum, and points out that ethnography "is given less attention in the capital city of the Empire than it is in countries which have far fewer responsibilities or even none at all towards uncivilized or alien peoples." It is proposed to revert to this matter in the final report. It may not be inopportune, however, to point out that the question is far broader than might be gathered from the reference in the Interim Report. It is not merely a question of the arrangement of the existing collections and provision for storage and additions. The need is more urgent. For one thing the period of time during which it will be possible to collect specimens is by no means unlimited, they are becoming rarer day by day before the advance of European civilization. What is needed is a museum devoted primarily to the study of the races of the Empire, though not confined to those races in view of the requirements of comparative work. It should not be regarded merely as a museum for exhibits illustrating the culture of our primitive peoples. It should make the fullest provision for research and above all for practical instruction, especially for the instruction of administrators and officials of the Dependencies. The provision for the practical side of the training in anthropology of administrators of the backward races in the Empire is virtually non-existent—certainly in London. If such an Imperial Museum were established, it is perhaps not indiscreet to mention that for its teaching and research department the nation might once more be indebted to the munificence and initiative of a private individual who is well known as an archaeologist keenly interested in ethnographical collections.

Daylight and Bird-Migration.

By V. C. Wynne-Edwards, B.A.

New experiments undertaken in Canada are investigating the relation of daylight and bird-migration, an aspect of the problem that has hitherto received scant attention.

PRACTICALLY all we know about bird-migration, except of the mere comings and goings, has been discovered in the last fifty years. For the latter half of this period interest has centred on what may be termed the geographical side, the "where" and not the "why" or "how," principally owing to the development of the marking method, introduced in this country about 1890, and ably developed by the German *Vogelwarte* at Rossitten, by Aberdeen University, and by the journal *British Birds*. With this began the era of direct experiment. Previous speculation advanced furthest along the "why"-branch, but it is only quite recently that this has been made susceptible of experiment also. These experiments are highly important, but at present bird-ringing so occupies the field that they have scarcely been noticed, let alone absorbed, by ornithologists.

The Reproductive Cycle.

Migration forms a part of the reproductive cycle of migratory species. It is characteristic of the northern hemisphere, being found in the southern only to a very limited extent. This is probably due to the almost entire absence of land in the southern temperate and sub-Arctic regions. It is rhythmic and annual: towards higher latitudes from lower in spring, and *vice versa* in autumn. That this is an echo, maybe distant, of the similar apparent movement of the sun through the zodiac is evident; and from this follows the idea that the ends served by migration may have something to do with the length of the day.

The most arduous part of the reproductive processes, even including migration itself, is the feeding and rearing of the young. Where the parents undertake this, as among the Passeres, the birds are said to be nidicolous; and where the young are hatched in an advanced stage of development, ready to leave the nest almost immediately and fend for themselves or under parental guidance, as among the waders (*Limicolae*) and game-birds (*Galli*), they are termed nidifugous. Whether nidicolous or nidifugous the growing chick requires a practically continuous supply of food from dawn till dusk, and in many species extensive territorial arrangements are made to allow of its more speedy collection. For this reason the

greater length of the day in the breeding season in high latitudes is of the utmost benefit to the species. Mr. Savage English has recently shown that among the majority of nidicolous birds in this country clutches average a little over five, and species that lay two or three eggs are exceptional. Here the May-June day-length is from seventeen to nineteen hours; while in the tropics, where it is always about thirteen hours (allowing for the short twilight periods), the exceptions are those species which have more than two or three eggs. In noticing the latter he shows that the tropical woodpeckers, for instance, can obtain practically unlimited food by just tapping at the mouths of the termite burrows to set the stream going, and can thus support a large number of nestlings without difficulty; and, on the other hand, the northern nightjars, which lay only two eggs as a rule, are nocturnal. It appears that birds are limited in the size of their clutches not by their physiological ability to produce eggs, since many species rear more than one brood, but by their physical ability to supply enough food to their young in the given time, which is usually whilst the daylight lasts.*

A Neglected Study.

The idea that daylight has anything to do with migration has been curiously neglected. Ornithologists from the time of Aristotle to the present have sought to find an explanation in the weather, and more particularly in temperature changes, their theory being that in spring the birds fly north to avoid the coming heat, and in autumn they return to avoid the coming cold. The latter tenet may be criticized as being teleological; but to speak of the "coming heat" in the tropics, where seasons are differentiated only as being wetter or drier, or in the southern temperate regions on the verge of winter, is ridiculous. The Swedish poet Runeberg (1804-1877) appears to have been the first to connect daylight and migration in his suggestion that the birds' motto should be *lux mea dux*, and his view was published in *The Times* in 1874. At the same time there appeared some merely fantastic theories, one of which supposed that migrating birds

* In nidifugous species the number of eggs which the parent can cover and keep warm is, of course, a limiting factor.

were caught up in a vortex and carried involuntarily in the upper strata of the atmosphere. Prof. A. Newton, throwing away the baby with the bath-water, quashed the whole lot in a letter to *Nature* (1874). In dealing with the former he confused the motive, to which Runeberg referred, with the impulse or stimulus to migration, when he pointed out that its great fallacy was this, that in autumn many species not only start their southward migration, but in some cases complete it, before the equinox, and are thus moving into shorter and shorter days the further they go. *Mutatis mutandis*, the same is true of the spring also. If a bird seeks the longest day available within its range of latitude, why does it start to move before the equinox? This question was again raised by Schäfer (1907).

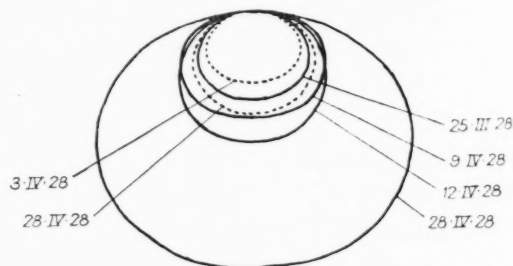
That migratory species benefit by the long summer days of high latitudes is sufficiently clear. No explanation is given, however, of the actual stimulus or series of stimuli which sets them off. A review of the literature on the subject has been given recently by Prof. Rowan (1926), who has been able to support his views by direct experiment up to a point conclusive. The clockwork regularity of arrival of migrating birds, which is more readily detected than their departure, does not appear to be correlated with temperature changes, for the weather at the same time is sometimes cold and often stormy. It may be argued that many species start further south on their northward migration, and are thus not under the influence of our variable climate, but encounter it when the pendulum is already swinging; yet there are others, for instance, the fieldfare, which winter with us, whose departure is none the less regular. Indeed, the only physical cycle which is sufficiently stable to serve as a basis for migratory stimuli is the waxing and waning of the day, which, being astronomical, is independent of the vagaries of terrestrial phenomena.

On this premise both Schäfer and Eifrig (1924) have advanced similar theories, namely, that the changing day-length is directly responsible for the initiation of migration each year. This has come to be known as "photoperiodism." Schäfer was alive to Newton's objection mentioned above. There are, too, other equally cogent reasons why the photoperiodic theory is unsatisfactory in this simple form. For one, in the tropics the day-length does not change; and for another, further south, for instance in South Africa where the swallow winters, the day-length is changing the wrong way, getting shorter instead of longer when the birds start north.

Rowan has introduced the idea of rhythm into the theory of photoperiodism. Man, like the barn-door

fowl, has lost almost all traces of (annual) reproductive rhythm, and is thus not sufficiently reminded of its almost universal presence in the remainder of the animal and plant kingdoms. Cases are known where, though the stimulus be removed, the rhythm may still continue for a time, though not indefinitely. For instance, certain trees when transplanted to the tropics will go on shedding their leaves at the usual season, adding annual rings to their wood, for a period of years, till at last the rhythm is lost, and leaves may be falling from one branch at the same time as buds are opening on another. The lunar periodicities of spawning of the marine Turbellarian worm *Convoluta*, which persists for some time indoors in an aquarium, and of the Palolo worm, are mentioned in every popular work on zoology. The rhythm is that of a flywheel, which, though it carries considerable momentum, slows down ultimately unless some motive force is from time to time applied. It is the express purpose of a flywheel to carry the movement on between successive explosions in the cylinder; and, maybe, in the case of migration the rhythm is carried on between successive periods of subjection to the stimulus of changing day-length. Once the possibility of an established rhythm, inherent in the bird, is grasped, many of the chief obstacles fall to the ground.

A rhythm of this kind is the result of an internal physiological mechanism; so that tracing the annual initiation of migration to photoperiodism is only a step towards the discovery of the real stimulus. Recently work has been done by Rowan and is still in progress to find the effect of light on the development of birds' reproductive organs, and it appears to be yielding most fruitful results. These experiments have not yet had time enough to be repeated by other workers or to be substantiated in a scientific manner; consequently further work may necessitate a considerable revision of our present theory. The main principles, however, appear to be fairly secure.



REPRODUCTIVE DEVELOPMENT.

Diagram of the relative sizes of the male reproductive organs of experimental and control birds, showing how those in birds artificially kept awake developed far in advance of normal. Dotted lines and left-hand dates refer to controls; black lines and right-hand dates to experimentals. (From Rowan, by courtesy of *Nature*.)

The reproductive organs (or gonads) of birds undergo an annual cycle. In winter they are relatively small, maturing and increasing rapidly in size towards the breeding season, after which they shrink slowly to their winter minimum again. In the females the presence and size of the ovarian follicles is an indication of ripeness. Rowan, working in Canada, trapped Juncos on their autumn migration and put them in cages. One cage was illuminated for increasing periods after sunset so that the occupants were artificially subjected to increasing lengths of day. The other was kept under natural conditions as a control. Some birds from each cage were liberated from time to time, and others were examined for their state of maturity. By early autumn the winter minimum of size was reached by the gonads of the experimental birds, and, although control birds flew away on liberation, these experimentals returned to the cage.

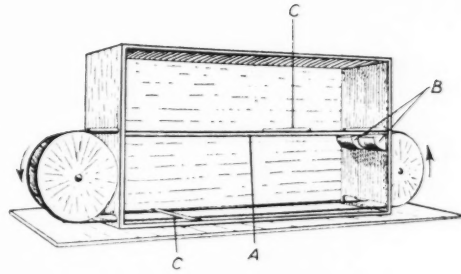


THE JUNCO OR "SNOW-BIRD."

The *Junco hyemalis*, which breeds in sub-arctic Canada, and is a winter visitor to the United States. It was used by Prof. Rowan in his experiments at Edmonton. (From Wood's "Illustrated Natural History." By courtesy of Messrs. Routledge.)

From this it appears that birds whose gonads have reached the winter condition no longer desire to migrate, although the season for doing so is still appropriate, as witness the departure of the controls. Later the gonads of the experimentals started to increase, while those of the controls were still diminishing with the approach of winter; so that by the time the earliest wild juncos began to arrive in spring the gonads of the experimentals were appreciably larger than those of their wild congeners.

It is difficult to see how daylight could directly effect changes in an internal system of the body. Further experiments in 1928 were therefore made to find out whether increasing activity, brought about by the daily extension of the waking hours, was the direct cause of the development of the gonads. These were most ingenious. The cages, instead of being



PROFESSOR ROWAN'S EXPERIMENT.

Experimental cage in which the Juncos were kept awake by making them hop over a bar C which sweeps through the cage on the travelling belt A. (From Rowan. By courtesy of Nature.)

illuminated, were covered up at the same time each day so that the day-length remained constant; and the birds were *kept awake* for increasing periods after dark by contriving that they should have to hop over a bar fixed to an endless band revolving on two drums outside the cage, which swept the perches every twenty seconds, so that a bird caught napping would be tumbled over. This was in March and April when the gonads were normally maturing. Every three weeks a sample was taken from both experimental and control cages (which were also darkened to keep the day-length uniform); and whereas the gonads of the latter showed practically no change in size, those of the former developed relatively enormously in a short time.

This interesting investigation shows how altering day-length might afford the stimulus to migration by increasing the daily period of activity, which in turn is correlated with the increase in size of the gonads. Although it is very plausible that the recrudescence of the gonads should stimulate migration, this is the weak link in the chain. It might be found, for instance, that a hormone from some other gland was proliferated at the same time and for the same reason (increased activity), which was ultimately responsible for the phenomenon. At all events, it illustrates how complex a series of events may be involved in the annual initiation of migration.

It is noteworthy how easily the reproductive rhythm may be upset in the Junco. Evidently it is not inherited. In other species, for instance, trans-equatorial and intra-tropical migrants—of which more will be said below—the rhythm must be inherent since the increasing-activity stimulus is inoperative. Parallel illustrations may be taken from the plant kingdom. The Junco may be compared to the plant *Hydrangea*, which as is well known will produce blue flowers, instead of the usual pink ones, when it grows

in a soil rich in iron salts. It is not the blue flower that is inherited, but the aptitude for producing blue flowers upon being suitably stimulated. So with the junco, it is not the annual reproductive rhythm which is inherited, but the aptitude to reproduce. The stimulus is essential. The other species mentioned may be compared to white heather, for example, which always produces white flowers under any conditions, for with them the rhythm appears to be inherited *in toto*. Open-mindedness upon the question of how much of the great reproductive instinct is inherent, and how much is acquired anew every year, is essential to the investigation of this problem. Just as there is every degree of migration from the local movements of species like the English robin to that of the curlew-sandpiper, which travels practically from pole to pole, so it may be expected that the degree to which the instinct is heritable will be subject to great variation also.

Certain exotic species (*e.g.*, the Mexican swallow, *Progne*), migrate annually from the forests to the mountains to breed, without leaving the tropics at all, though the majority of native tropical birds are stationary. In this case daylight cannot be the basis of the migratory impulse; yet a rhythm is developed, and the journeys appear to be made at the same time each year. At present it is impossible to reconcile this with the photoperiodic theory. The flywheel appears to be endowed with perpetual motion.

It might be questioned whether the long northern summer day is of any value to nocturnal birds.

Indeed at first sight it seems to be directly inimical to their habits; but in those groups in which migration is well developed, as it is in the nightjars (*Caprimulgi*), the birds are not truly nocturnal but crepuscular, feeding in the twilight, thus gaining enormous benefit from their sojourn. Owls, on the other hand, which feed actually in the night, are for the most part non-migratory.

Whatever its present limitations, photoperiodism is a subject to be commended to all naturalists. Recently a review in *Discovery* claimed the theory as original, which illustrates the scant attention paid either to the recent developments of the theory, now partly substantiated by Prof. Rowan's experiments, or indeed to the theory at all.

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Among the Stars: A Monthly Commentary.

By A. C. D. Crommelin, D.Sc., F.R.A.S.

THE FACE OF THE SKY FOR NOVEMBER.

SEVERAL planets are on view during this month. Jupiter takes the leading place, being above the horizon nearly all night. Mr. B. M. Peek and Rev. T. E. R. Phillips reported an interesting development on the planet in August and September: a curiously shaped marking between the south equatorial and south temperate belts expelled a number of small dark spots, which proceeded to move westward on the planet's surface, keeping near the edge of the south equatorial belt. Their speed was 120 miles per hour, which gave a rotation period of 9 hours 59 minutes; this is the longest ever recorded for markings on the planet; the outbreak also produced a disturbed region on the edge of the belt, which moved in the opposite direction, but at a much slower rate. These phenomena demonstrate the intensely active forces that are at work in the Jovian atmosphere.

Mars is now approaching opposition, and is stationary on the 12th November near the third magnitude star Epsilon

Geminorum, which affords an excellent point of reference for studying the planet's movements; these are first towards the east and then towards the west. On the evening of 18th November the planet is only 17 minutes (that is, little more than half a moon's breadth) to the south of the star. It is approaching the earth, being 69,000,000 miles distant on 1st November, and 56,000,000 on 30th November. The least distance, 54,000,000 miles, will be reached in mid-December.

Mercury and Venus.

Mercury may be seen as a morning star about 9th November; it is in Virgo, not very far from Spica, and rises nearly two hours before the sun. Venus may be seen in the early evening, low down in the south-west. It is near the moon on the evening of the 15th. It will be better placed in the following months. Uranus also is now easily observed, being due south at half-past 8 p.m. in the middle of the month. Its right ascension is then 0 hours 15 minutes, north declination 50 minutes. The nearest

naked eye star is 44 Piscium, which is over a degree to the north-east of it. A chart of its path among the stars is given in the B.A.A. Handbook for 1928.

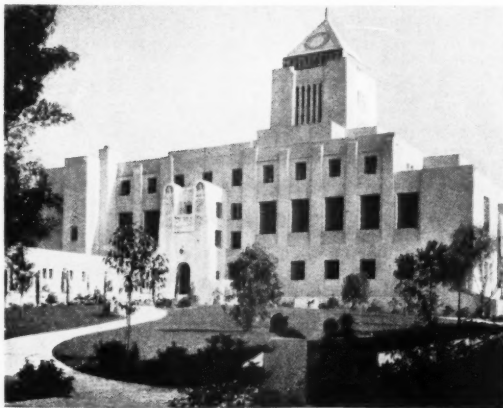
A partial eclipse of the sun will be visible in the British Isles on the morning of 12th November. In London the eclipse begins at 7.40 a.m., the greatest phase, about one-fifth of the diameter, is about 8.28 a.m., and the end at 9.18 a.m. If we go back six Saros cycles we come to the annular eclipse of 1820, 7th September. Nine-tenths of the sun were then covered in England. The central line crossed the Zuider Zee, also Lugano; Wordsworth saw the eclipse there, and refers to it in one of his poems.

The eclipse is slowly diminishing at each return; the greatest phase is now eight-tenths, in north Siberia. Notes on several of the eclipses of this cycle will be found in Johnson's "Eclipses Past and Future."

There is a total lunar eclipse on the morning of 27th November. The moon sets in London a few minutes after first contact with the umbra, which is at 7.24 a.m., but the smokiness due to the penumbra may be seen some minutes earlier. In the north-west parts of the British Isles a good deal more of the eclipse will be seen.

Many amateur observers now note the times of occultation of stars by the moon; Professor Brown has found these observations of great use in determining the errors of the moon's place as compared with his lunar tables. Those who wish to observe them regularly should obtain the Nautical Almanac, or the Handbook of the British Astronomical Association. The brightest star occulted during November is 30 Piscium, magnitude 4.7, which will disappear for London observers at 5.43 p.m. on 22nd November. To be of any use the times of disappearance of stars must be noted to the nearest second, the exact error of the clock being found from the wireless time signals.

There are two well-known meteor streams that the earth intersects in November; the Leonids, whose radiant is in the Sickle of Leo, about 14th November; and the Andromedids, the relics of the lost comet of Biela, about 18th November. Their radiant is near Gamma Andromedae. The search in each case may extend a few days before and after the date given. There were very rich showers of Leonids in 1833 and 1866, but there was disappointment in 1899, the action of Jupiter having diverted the richest part of the swarm from the earth's orbit.



NEW PUBLIC LIBRARY AT LOS ANGELES.

Book Reviews.

Further Impressions of the Public Library System of the United States of America. By K. E. OVERBURY and E. E. LOWE, B.Sc., Ph.D. (Published gratis by the Carnegie United Kingdom Trustees, Dunfirmline.)

These impressions of two English delegates, Miss K. E. Overbury from the West Riding of Yorkshire and Dr. E. E. Lowe from Leicester, who attended the conference of the American Library Association in Toronto in 1927, are written as addenda to those of six delegates to a previous conference. Their enquiries and observations show that the libraries are everywhere playing a great and growing part in the active educational system of America, besides giving endless service to those who have passed beyond its immediate influence.

There appears to be a spirit of friendly rivalry between the States, and cities within them, in their efforts to build up and endow the most palatial and efficient library. The enterprise of the American Library Association and the munificence of individual benefaction, for which America is famous, must not be overlooked in this survey of the resulting system. The staff of the great majority of the libraries visited was almost wholly composed of women, and every comfort was provided for a very adequate staff as judged by English standards.

The results of America's greater expenditure on the education of each individual child, compared to other countries, is shown in the fact that in most, if not in all, schools there is some kind of library. This school-library may be run entirely by the school board but in the majority of cases it is run as a section of the local public library; or there is a very close co-operation in those cases where the public library is situated in the school buildings—the main library then being separate from that of the school, but allowing the school children many advantages of the town library which would otherwise be unobtainable.

Another feature in the regular work of many American libraries is the arranging of "story hours" for children in the library itself—and a series of talks to all school-children on the attraction and advantages of the local collection of books. This work in the school is followed by active assistance given to the adult reader, the American Library Association issuing handbooks in a "Reading with Purpose" series, which results in a necessary duplication on a large scale of popular current volumes but which does ensure that the general public are regularly informed.

Although one quarter of the population are enrolled members of the local libraries, there are large areas including a population of 45,000,000 which still remain without any local library provision, these mainly in the rural districts. On the other hand, owing to the small centres of population and other considerations, service "by contract" is frequent. Thus legislation exists whereby (i) a county library service may be secured by contract with an existing city library or libraries; in some States contract service is the only one authorized where a public library is in existence; (ii) counties may contact with each other for a joint service; (iii) a city library may become the centre of a county system. Furthermore, American libraries possess special facilities for lecture-work and club activities which are unknown features of the English library system—and utilize to the full the organ of press publicity to ensure that the system is fully used by the general public.

That this comparison between the American and English Library systems is constantly in the minds of English librarians

was seen at this year's Oxford conference of the Library Association, where several speakers emphasized the progressive and up-to-date American methods.

South Africa's Past in Stone and Paint. By M. C. BURKITT. (Cambridge University Press. 12s. 6d.).

Although it is notoriously unsafe to prophesy, there is little risk in saying that for future generations Mr. Burkitt's "South Africa's Past in Stone and Paint" will mark an epoch in study of the prehistory of that great sub-continent. Books—authoritative books—have been written about South Africa's Stone Age by South African archaeologists; there are authorities on the stone implements of South Africa in this country, notably Mr. Henry Balfour of the Pitt-Rivers Museum. Yet South African writers, however intimately they knew their own material, did not, indeed could not, possess the close acquaintance with the prehistory of the north—both Europe and Africa—necessary for detailed comparative work. Mr. Balfour, wide and profound as is his knowledge, has been interested in specific problems in typology, touching upon prehistory incidentally as it bore upon his subject, rather than as a main objective. Mr. Burkitt, on the other hand, entered upon the archaeological tour of which he here gives the results at the invitation of the University of Cape Town with the definite object of surveying South African archaeology as a whole. Further, he had as his background an acquaintance with the prehistoric archaeology and early prehistoric sites of Europe which is as close, if not even closer, than that of any archaeologist of the day, excepting only the leaders of the French School.

In the last few years Africa, and especially East and South Africa, have been rapidly taking that place in the study of the history of man which they should hold in view of Charles Darwin's expectation that in this continent we should find man's place of origin. Consider what South Africa has given the anthropologist. There is the occurrence there, now known for some time, of stone implements which in type resemble the palaeoliths of Europe, found sometimes in the geological conditions which appear to resemble those which we expect in association with vestiges of early man in Europe—discoveries for which the antiquity claimed was at first treated almost with derision, but now almost fully accepted. Then there are the Bushman paintings, of which the resemblance to the later palaeolithic art of Eastern Spain is most striking. In this connexion, though not in the same genre, may be mentioned the remarkable resemblance in the physique of the Bushman and the steatopygous ivory female statuettes carved by Aurignacian Man and found in the French caves and elsewhere in Europe. The Zimbabwe, the great structures of brick in Rhodesia, are still an unsolved mystery, neither their date, their purpose, nor their builders being known as yet except by conjecture, though this ranges from Solomon's Sheba to native tribes of only a few hundred years ago. And, finally, of man himself we have the primitive forms of the Boskop Skull, and the Neanderthaloid Rhodesian man who, whatever their date in years, must take an early place in the growth of the human tree, while Professor Dart's *Australopithecus* lays claim to an even more lowly place in the same line.

Mr. Burkitt's readers owe an immense debt to South African archaeologists for the liberality with which they placed their knowledge and their collections at his disposal. He travelled over six thousand miles, visiting numerous archaeological sites

and examining quantities of implements in collections, both public and private. He speaks in terms of amazement at the wealth of material which was placed before him. He was specially concerned with two classes of evidence—the stone implements and the Bushman paintings and engravings. These he has surveyed in detail.

Briefly Mr. Burkitt's conclusions are that South Africa has afforded evidence of every phase of the Old Stone Age of Europe from the Chellean industry to the microlithic types which follow the close of the Palaeolithic. This does not necessarily imply that all are contemporaries with these European prototypes. The Chellean *coup de poing*, he points out, may be entirely modern, while some specimens most certainly are. But postulating the Lower Palaeolithic implements as typologically the earliest and as remaining long in isolation, they are followed by industries of Middle and Upper Palaeolithic, with strongly marked signs of local development. For certain of these the author has interesting suggestions to offer which point to possible lines of connexion with the different epochs of Mr. Leakey's remarkable discoveries of the remains and culture of Early Man in East Africa at Elmenteita and Nakuru. In like manner Mr. Burkitt finds a sequence in the art of the Bushman, where he distinguishes an early and a later school which he correlates with certain industries. He has some interesting remarks to make on its possible relation to the art of Eastern Spain and the migration of the Capsian peoples.

Ethnological and linguistic evidence point to a constant migration of peoples into what is now the Union of South Africa, which was still going on up to quite recent times. It is interesting to note how Mr. Burkitt's conclusions bear this out. This country is, indeed, as he says, "a gigantic, wonderfully stocked museum of the past." No one would be less ready than Mr. Burkitt to claim finality for this book; but it has laid the foundations well and truly for the study of South Africa's remoter past.

E. N. FALLAIZE.

The Station. Athos; Treasures and Men. By ROBERT BYRON. (Duckworth. 18s.).

Readers of "The Monuments of a Millennium" in our columns for October will find increased pleasure in Mr. Byron's full account of the expedition on which his article was based. Nor does it reflect unfavourably on either piece of work to admit that the book provides a freer hand for the author's keen sense of humour, which contributed in no small measure to the success of his unusual venture.

Accompanied by several kindred spirits and amply provided with introductions, Mr. Byron set out on a second trip to Mount Athos. "He who formerly visited your holy place," wrote the Ecumenical Patriarch of Constantinople, head of the Orthodox Church, to the Synod of the Holy Mountain, "the learned Englishman Mr. Robert Byron, anxious there to pursue his researches in Byzantine art, comes thither for this purpose, intending particularly to photograph the frescoes of the leading churches. We, therefore, gladly urge . . . that there be afforded him everywhere a courteous reception and treatment," etc. It must be remarked in passing on this impressive document, reproduced with facsimile signature, that the illusion is rather rudely diminished by the Patriarch's reference to the 20th "ultimo," that hall-mark of modern business correspondence; but of the value of his letter there can be no question.

On his first visit to Athos, the author was handicapped by ignorance of the vernacular which he had, however, mastered for the second journey. The consequent advantages are obvious, in these new pages, which tell of many privileges secured by the personal persuasion of certain officials whom the introductions had failed to convince. Many excellent photographs were secured, and Mr. Byron has in preparation a separate volume on "Later Byzantine Painting." He is, incidentally, an artist of no small accomplishment, as well as a practiced photographer.

In connexion with the language there are some outspoken comments on the teaching of Greek in English schools. "Though the average reader of the classics experiences no difficulty in reading a modern Greek newspaper, the pronunciation which he has been taught is one that not only no Greek can understand, but which denies, in addition, that very poetry of sound which Greek literature professes to reveal. Not, however, content with this purposeful obscurantism, the Anglo-Saxon professor, with the nauseating self-sufficiency of his kind, must even blame the native for pronouncing his language in the manner it demands."

Although the reviewer learnt the elements of Greek in the same preparatory school as Mr. Byron, he cannot claim to have pursued it far enough to comment adequately on this indictment of the "professional pedagogue." Suffice it to say that the passage just quoted is typical of many illustrating strong and original views, which in almost every case are supported with evidence and based on a careful study of the subject.

J. A. B.

The Story of the Birds. By C. J. PATTEN, Professor of Anatomy in Sheffield University. (Sheffield: Pawson and Brailsford. 16s. 6d.).

The material in this volume is based on a series of nineteen broadcast school-lectures delivered by the author from the Sheffield B.B.C. Station. By enriching and weaving their contents rather than by transcribing them the author, aware as he tells us of his own shortcomings, has, to his own satisfaction, made a story sufficiently interesting and instructive to justify its publication.

It is essential that even the amateur ornithologist, if he is really in earnest in the pursuit of his hobby of bird-study, should be able to understand the reason-why of his observations. This he cannot do unless he knows in more than broad outline the structure and function of all the intricate organs of the animal he is observing. To gain this knowledge he must obtain and examine in minute detail the dead bodies of birds of many species, which the author points out can easily be obtained without killing specially for the occasion—dead birds in fresh condition are to be had in plentiful numbers if search is made in the right place.

The technicalities, usually thought to be dry and tedious for the beginner, are dealt with in a manner the very opposite to dull, giving every amateur, who without this knowledge will always remain an amateur, an opportunity to become an "expert" with the smallest amount of study.

The first fifteen chapters deal almost exclusively with avian anatomy, and the second half of the book with the observational aspect of the serious study of birds. The language of birds, the mechanism of flight and migration are there discussed in great detail—including their purport, variation, and the problems of their correct observation and interpretation.

Perhaps the illustrations and lay-out of the book are too

reminiscent of that bug-bear of our schooldays, the old-fashioned textbook, but this feature may be excused to the detailed care which characterizes everything Professor Patten writes. The new volume should interest particularly the many readers who have become acquainted with his work in the columns of this journal.

The Social Insects: Their Origin and Evolution. By PROFESSOR W. M. WHEELER. International Library of Psychology, Philosophy and Scientific Method. (Kegan Paul. 21s.).

This is a series of twelve lectures delivered in 1925 at the University of Paris while the author was occupying a Harvard exchange professorship. They were first published in French, but the English edition is much enlarged. As in his earlier book, "Social Life among the Insects," the author begins by stating that, besides the struggle for existence, there is amongst animals a tendency to co-operation. But except in title the resemblance between the two volumes is remarkably small, although the same subjects are referred to. The previous volume was entrancing because it detailed the habits of social insects, and the present one is equally so because it discusses the habits and uses with great caution and wisdom. Similarities of habits are cited as evidence of relationship, and the author speaks of "behaviour patterns" running through groups.

After an introductory chapter, in which, incidentally, the inheritance of acquired characters is assumed as part of the biological faith, there are four chapters dealing with the evolution of social life in the hymenoptera, followed by one on that of the termites. Then there are two chapters upon the evolution of polymorphism, mainly discussing the ants, which have specialized in that direction, and the next chapter deals with trophalaxis as a factor in the evolution of social life. In the earlier work this subject was frequently referred to, but the author has now modified and developed the theory which he first put forward in a paper in 1918. Chapters X and XI discuss the evolution of guests and parasites and the evolution of parasites amongst the social insects themselves, both interesting subjects and very well worked out.

As usual in this author's works, there is an excellent bibliography.

FRANK BALFOUR BROWNE.

The Ancient Wells, Springs and Holy Wells of Gloucestershire. By R. C. S. WALTERS, B.Sc., A.M.Inst.C.E. (The St. Stephen's Press, Bristol. 12s. 6d.).

"The customs, long preserved among the mountains,
Should not be lightly left to pass away.
They have their moral, and we often may
Learn from them how our wise forefathers wrought,
When they upon the public mind would lay
Some weighty principles, some maxim brought
Home to their hearts, the healthful product of deep thought."

With this verse the author appropriately ends his account of past and present ceremonies held annually, or oftener, at the site of ancient wells, especially those in Gloucestershire, for the book is both an account of those still practised and a stimulus to those interested to collect and preserve accounts of others.

The holy wells in Gloucestershire at the present day are nearly all dedicated to a saint, are said to be capable of curing disease or granting a wish, and are only rarely decorated with flowers. Annual festivals are still regularly held at some of these ancient wells, most often in rural areas. Perhaps two of the more widely known "flower-decorating" ceremonies are

those held annually at Stowe, near Lichfield, and Tissington, Derbyshire. They are both described, although held far outside the boundaries of Gloucestershire.

The study of the traditional legends about these wells is an interesting branch of folk-lore; and of the many mentioned, perhaps the most unique is that of St. Kenelm's Well, Winchcomb. Kenulf, King of Mercia, who founded Winchcomb Abbey in 789, was succeeded by his seven-year-old son; but Quenride, his ambitious half-sister, persuaded his tutor to do him to death and hide his body far away in Clent, Worcestershire. A pure white dove, however, bore this message to the Pope: "In Clent in Cowback, Kenelm King's bairn lieth under a thorn, bereft of his head." His body was found and brought back to Winchcomb by Clent monks, and wherever the body rested on the journey, springs miraculously appeared; St. Kenelm's Wells at Winchcomb and Clent being the two which remain flowing to this day. Similar legends may amuse us to-day, but they show the credulity of the pilgrims of old, and are instructive in showing how much of the ancient pagan ritual was incorporated into Christian festivals. Excavations at these sites yield much archaeological material, owing to the Roman practice of throwing coins and other objects down wells in an act of "worship," as described by the author in *Discovery* (November, 1926), when several of the photographs first appeared.

The Bishop of Gloucester contributes a preface to this interesting book, which we join him in commending not only "to those to whom the historical memorials and the picturesque beauties of Gloucestershire are dear," but to all who are interested in the primitive thoughts and ideas of mankind.

A. R. E.

Hanno, or the Future of Exploration. By J. L. MITCHELL. (Kegan Paul. 2s. 6d.).

This volume is one of an admirable series published under the title "To-day and To-morrow." The publishers tell us that these books "written from various points of view . . . provide the reader with a stimulating survey of the most modern thought in many departments of life." Readers of *Discovery* are, we believe, keenly interested in all such surveys, and are prepared for a certain amount of fantasy provided that the pamphlet is written in reasonable language and has some basis for its imaginative prophecies, but imagination of the gas-bag variety set upon a minimum of ill-digested data will not do, and when there is added a distinct flavour of acerbity the result is a poor thing. It is well enough to dream of a helicopter which is to make all land exploration possible and easy, or to envisage the future traveller penetrating to the bottoms of the ocean basins in super-machines. But such innocent dreaming should not be mixed up with vague insinuations against past explorers and obscure pronouncements upon the faults of modern travellers.

We are forced to wonder upon what authority it is stated that the discipline of past expeditions has been "productive of little more than sloth, indifference and responsibility-evasion," and why it should be described as "monkey-adornments of uniform" and "clownish posturings." Indeed the book is rather stamped by the constant use of such immature journalese as "wonder-urge," "magnetic allure," and "searchlight-stabbed darkness." Nor should it be necessary to dub the conqueror of Mexico a "meanly-bearded clown."

Surely the editors of the series must have been nodding to have passed such a sentence as "Resultant on strange desert

stravaigings with undigested caravans, the European presses yearly disgorge stout volumes of unbelievable stodginess and inaccuracy." It is difficult to see any connexion between future exploration in the Antarctic or the moon and the debatable subject of contra-conception, but the author succeeds in introducing the subject. Were it not for this turgid and sententious style it might be amusing though not instructive to follow the author into the interior of the earth which he is confident is a hollow sphere, but reasonable men have patience with absurdities only when they are really well told. The book is altogether trifling, full of puff and immaturity, and entirely unworthy of those of its fellows in the series which the reviewer has read.

Polar Research Institute,
Cambridge.

F. DEBENHAM.

The Modern Malay. By L. RICHMOND WHEELER. (George Allen & Unwin. 15s.).

Mr. Wheeler's book is a welcome addition to the literature of the Malay Peninsula. For although much has been written about various aspects of Malayan life, change in the Peninsula has been rapid since the war. How it affects the Malay may be estimated from the remark that the records of religious beliefs and customs and the folk tales which once loomed so large in native life are now of interest to the ethnologist only, and in no way represent the real thoughts and beliefs of the people. It is admitted, however, that a great deal of such superstitious practice and belief is still to be found among the uneducated Malays. Mr. Wheeler, therefore, does not linger too long over the past. His account of the history and ethnology of the Peninsula is, however, adequate enough to supply the background for his picture of the present day.

It will perhaps come as a surprise to many who are not acquainted with actual conditions to find for how little the Malay appears to count in the active centres of life in the Federated States, due in part to the fact that in the communal and productive life the part which in other communities would be played by the native and the European trader is here taken by Chinese and natives of India. Town life does not appeal to the Malay. Mr. Wheeler by no means shares the pessimism with which these facts have inspired other writers, and sums up his survey of the people as they are to-day in a decidedly optimistic vein as to the possibilities of the future.

E. N. F.

The Lure of Bird Watching. By E. W. HENDY. (Jonathan Cape. 7s. 6d.).

In his introduction to this volume Mr. J. C. Squire reminds us of some of the memories of earlier years conjured up by the phrase "The Lure of Bird-Watching." Of a youthful egg-collecting expedition, he writes: "The eggs were the prize and the collection the goal: at least I never stripped a nest. There, perhaps, lies the secret: . . . unchecked, the birds would get out of hand; over-plundered they would be extinguished. An awareness of this probably accounts for the fact that half the most ardent bird-lovers in England are also eager shots. They will shoot one kind of bird, which is very common . . . they will no more think of shooting another kind than they would think of shooting their brothers and sisters."

Although there are to-day a host of observers who watch birds with enthusiastic affection and would never dream of killing a rare bird, yet, with all the measure of protection afforded by law to the less common of our native species, there is much

work to be done by bird-lovers in order to educate the public, and particularly the youthful section of it, to appreciate the enjoyment of watching a living bird in its natural surroundings, rather than of keeping a pet in cruel captivity or of gloating over a costly array of eggs of rare species.

Mr. Hendy introduces us to some of the trials as well as the joys of the ardent naturalist. There are not many who would enjoy a day spent in catching and ringing puffins and gulls in their filthy holes; yet such work has its compensation for the enthusiast in the knowledge so gained of bird migrations.

Foreign visitors as long ago as the Middle Ages observed that the English were fond of the country. That fondness still remains in a large percentage of our population, whatever the effect of the overcrowding in great centres. The chapter on the aesthetic appeal of bird watching will thus be read with general interest, as also will be the following detailed description of observations on a few species of especial interest for their rarity or beauty. The observations on "bird song," "birds in captivity," and "birds and bird-tables," will add another to a long list of pleas for a more "humane" interest in ornithology. Altogether this is a delightful book.

Rocks and Minerals. A magazine for collectors. (Edited and published by Peter Zodac, Peekskill, New York. 35 cents.)

A certain section of *Discovery* readers may be interested to learn of a fairly recent addition to those quarterly magazines published for collectors. An American publication, "Rocks and Minerals," is the official journal of the Rocks and Minerals Association. It is not solely of American interest, although at present compiled chiefly on American data. The current number contains particulars of a reward of \$5,000 promised for the location of a deposit of dolomitic limestone, known to occur within a certain defined western area, which is sensitive to static electricity. Side by side we find notes for the amateur and descriptive articles on rich mineral areas. An interesting feature of the immediate past and future numbers is a complete alphabetical list of gem names.

The cost is 35c. per copy—\$1.25 per annum for foreign subscribers; and we understand that the magazine is the only non-technical American publication devoted to minerals.

Preparation of Scientific and Technical Papers. By S. F. TRELEASE and E. S. YULE. (Baillière, Tindall & Cox. 7s.).

It is a regrettable fact that many scientific research workers and others are unable to write in simple yet scientific phrase for both the general reader and their fellow-workers.

The material contained in this volume was drawn up in the first instance for the use of students writing themes and theses at the college of Agriculture in the University of the Philippines. Enlarged and put into book form, although published at a high price, it will be an admirable guide to any submitting manuscripts for publication—a time saver to author as well as editor, since among the useful data a list of printers' correction marks is included.

Horology. By J. E. HASWELL. (Chapman & Hall, 25s.).

The main object of this treatise is to provide information and technical data for the serious student. A short consideration of time measurement precedes the main account of the history and construction of time-recording instruments from the earliest Egyptian and Babylonian "Clepsydra" to the most intricate and refined modern marine box chronometer. The print and illustrations of this volume are excellent.

The Earth and its History. By J. H. BRADLEY, JR., Ph.D. (Ginn & Co. 12s. 6d.).

Old Mother Earth. By K. F. MATHER. (Harvard University Press. 11s. 6d.).

Following the precedent of the majority of University professors, Dr. Bradley tells us that this volume has grown out of the need for an elementary text-book for use in a short course. The material is arranged with an eye to general principles rather than to special applications, and in pursuance of this plan only a very short general account is given of the detailed geological history of the North American Continent, whilst the history of life on the earth and the growth of knowledge of the earth is treated comparatively fully. For a one-year course this text-book is quite a valuable addition to that long list already available.

Fifteen essays, based on broadcast talks from the WEEL Station, Boston, during last winter, are brought together in this second volume with many well-produced illustrations. The subjects are treated in a simple manner for the general reader, and are written in a very readable style. Although the appeal of this book must be primarily to the American public, our chief criticism of the series of essays is that reference is made only to American natural phenomena.

Symbols and Formulae in Chemistry. By R. M. CAVEN and J. A. CRANSTON. (Blackie & Son. 15s.).

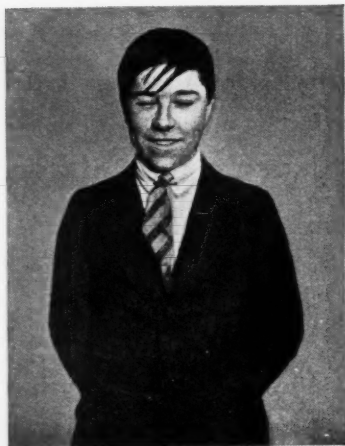
In no sphere of science is it truer than of chemistry that no student can grasp the real meaning of modern scientific theory until he has become familiar with the attempts of past generations of workers to explain phenomena which may yet remain mysteries; and in particular of the study of chemical constitution and reactions where the manner of representation is symbolic—and has been at any one time representative of the stage reached in the progress towards modern chemical theory.

The authors have traced the use of symbols and formulae from the days of old when the alchemists used their picturesque representations of the metals borrowed from Egypt, through the days when Dalton first laid the foundations of modern symbolism, and the nineteenth century with its research and controversy on the constitution of matter, to the present day with its complex theories of valency and stereochemistry. The revolution in thought, brought about by Dalton's views on the atomic structure of matter, and Berzelius' electrochemical theory, may be said to have initiated the growth both of modern chemical theory and symbolic representation.

Oddities: a Book of unexplained facts. By R. T. GOULD. (Philip Allan & Co. 12s. 6d.).

This collection of eleven unexplained "mysteries" which have remained unsolved, some of them for centuries, provides interesting reading. The Devil's Hoofmarks, seen in Devonshire after a snowstorm in 1855; the vault at Barbados in which the coffins were continuously found disturbed by an unknown agency through the course of years; the possibility that two ships seen stranded on an iceberg near Newfoundland in 1851 were those of Sir John Franklin's last expedition of 1845—these and other "phenomena" are collected together and all the possible and probable explanations given. As no completely satisfactory answer can be given to any one of these, the reader is left in that delightfully perplexing state of mind which is always terminated in detective mysteries.

GIVING THE EAST END BOY A CHANCE IN LIFE



ONE OF THE HOSTEL BOYS

"It would, I am sure, be difficult to exaggerate the importance of providing a working lads' hostel in East London; it is hopeless to expect boys to make a real effort to lead industrious lives if they are living with parents who are loafers and drunkards."—Mr. Clarke Hall, the Magistrate at Old Street Police Court.

AMID the dreary labyrinth of streets and the sullen masses of bricks and mortar that are collectively designated "Stepney," there is now to be found an oasis offering comfort, help, and pleasant surroundings to those who, in the very early stages of life's battle, have found the odds against them. This oasis is represented by an imposing and extensive building in Bower Street, which is the scene of the beneficent activities of the John Benn Hostel and Milner Hall. Opened by the Prince of Wales a year ago, these two institutions have already fully justified their claim to public support and recognition, and have demonstrated in the clearest possible way how necessary and how urgent was the establishment of some such centre in the district. Since the days when Dickens wrote of that "reservoir of dirt, drunkenness, and drabs, thieves, oysters, baked potatoes, and pickled salmon," there has, of course, been a vast improvement in the lot of those who live in the East End of London, but in some of its sombre by-ways and alleys still stalk the spectres of evil; there are homes, sadly misnamed, where the young idea is trained in idleness, or worse, encouraged in vice, perhaps crime; there are places where drunkenness, want, destitution, and despair go hand in hand. To do something towards meeting the problem of the East End boy during his years of adolescence, the most impressionable years of his life, is the *raison d'être* of the John Benn Hostel, which was founded in memory of the late Sir John Williams Benn. It is there to befriend the friendless boy; to give him food and clothes when he is in dire need of them; to find an occupation for him if he lacks work—in a word to give him at least a reasonable chance of becoming a good and self-respecting citizen instead of a ne'er-do-well.

How far, in the short period of its existence, has the Hostel met the demands that it was called into being to satisfy? Visit the Hostel any day, but particularly of an evening when most of the boys, after their work, are at "home" and your impressions will produce an unmistakable answer to the question. To see the sixty or seventy boys who live in the Hostel at supper together, to hear the merry sound of their shouts, laughter and talk, is an experience to touch the heart and imagination of any man or woman who bears in mind that this happy, healthy-looking group of youngsters has, for the most part, been formed of juvenile "down-and-outs." It is the raw material of humanity redeemed from the slough of despond; being slowly but surely in most cases moulded into a better mental, moral and physical outline. Think for a moment of the potentiality of all this plastic material. Remember that it is pulsing with the life of our common humanity. Consider its import to the country and to the Empire.

Empire Builders! Strange as it may seem to those who have not been victims of the "tumbling-up" process, these boys, collected from cheerless streets and many places queer and undesirable, are not oblivious of the Empire. The world really means something to them; it embodies an ideal for them. Pass along the corridors on the top floor and note the neat labels on the doors—Cromwell, Nelson, Gordon, Scott, Wren, and Livingstone. These, it may astonish you to learn, are the names the boys chose—chose on their own initiative without prompting on the part of the Hostel staff—for their dormitories. They wish to be reminded daily of the example set by some of our great builders of Empire. No less than the public school boy are these boys hero-worshippers. Perhaps one—maybe more than one—is destined to write his name large across the history of the British Empire. Who knows?

Something yet remains to be written, so far as the limits of this appeal allow, of the Milner Hall, which commemorates the late Viscount Milner. The Hall may be described as the complement of the Hostel, and comprises two large floors in the same building. In the nature of what is known in America as a "Community Centre," it is designed to focus the social life of the people—men, women and children—of the district. A scheme is in progress for the formation of both girls' and boys' clubs (open to non-residents), and for the benefit of the people generally, community concerts, lantern and other lectures, debates, and similar activities. This side of the work, like the other section, holds possibilities of great development, but from its very nature, it cannot be expected to become self-supporting, and it is estimated that an annual income of £2,000 is necessary. The organizers, therefore, are bound to rely upon the generosity of a philanthropic public. The East End Hostels Association, registered in 1926 to found a series of Hostels in East London, began its work with these two institutions. The general membership of the association—of which Sir Ernest Benn is president of the council of management; and the Rt. Hon. Reginald McKenna honorary treasurer—is open to anyone subscribing 10s. annually or £5 in a lump sum. Cheques should be sent to the honorary secretary, at Bower St., Commercial Rd., London, E.1.

EAST END HOSTELS ASSOCIATION

